



CH2M HILL  
Hillsboro Executive Center North  
800 Fairway Drive, Suite 350  
Deerfield Beach, FL  
33441-1831  
Tel 954.426.4008  
Fax 954.698.6010

May 2, 2001

148010.P2.12.CH

Ms. Lori Wenkert  
South Florida Water Management District  
3301 Gun Club Road  
West Palm Beach, FL 33416

Subject: Phase 2 Interim Report (April 2000 to October 2000) on the PSTA Research and Demonstration Project (C-E8624)

Dear Lori:

We are enclosing six (6) copies of the referenced document along with an additional camera-ready copy that the District can use to make internal copies should the need arise. This report is the finalized version of the draft submitted in February 2001, and provides an interim summary of the data collected from the PSTA Test Cells and Porta-PSTA mesocosms during the study period of April 2000 to October 2000. The report files are being converted to .pdf format and will be forwarded to you in the near future. As discussed, a more detailed data analysis will be presented in the Phase 2 final report.

Copies of this document are being sent to the four members of the PSTA Scientific Review Panel: Ramesh Reddy, Bob Wetzel, Jan Stevenson and Jan Vymazal. In addition, we are forwarding copies to Frank Nearhoof and Taufiqal Aziz at the Florida Department of Environmental Protection, Nick Aumen at the National Park Service, Ron Jones at FIU (c/o Evelyn Gaiser), Bob Kadlec and Bill Walker. These additional copies will be shipped by the end of this week.

As always, should any questions arise regarding the enclosures, please feel free to call.

Sincerely,

CH2M HILL  
*for Ellen B. Patterson*  
Steven W. Gong  
Project Manager

DFB/011200016/SET2001.DOC

c: Jana Newman/SFWMD  
Bob Knight/WSI  
Jim Bays/CH2M HILL  
Ellen Patterson/CH2M HILL



# Periphyton-Based Stormwater Treatment Area (PSTA) Research and Demonstration Project Phase 2 Interim Report (April 2000 - October 2000)

*Prepared for*

**South Florida Water Management District**

*Prepared by*

**CH2MHILL**

May 2001

# Contents

---

Section	Page
<b>Executive Summary.....</b>	<b>ES-1</b>
<b>1 Project Background .....</b>	<b>1-1</b>
1.1 Introduction.....	1-1
1.2 Summary of Phase 2 Experimental Design and Treatments.....	1-2
1.2.1 South ENR Test Cells.....	1-2
1.2.2 Porta-PSTA Mesocosms .....	1-2
1.2.3 Field-Scale Pilot PSTAs .....	1-3
1.3 Summary of Phase 2, and Research Timeline.....	1-5
1.4 Environmental Forcing Functions .....	1-5
<b>2 Phosphorus Removal Performance and Effectiveness .....</b>	<b>2-1</b>
2.1 Introduction.....	2-1
2.2 TP Concentration and $k_1$ Trends.....	2-1
2.2.1 Phases 1 and 2 Porta-PSTA Treatment TP Time Series .....	2-1
2.2.2 Phases 1 and 2 Test Cell TP Time Series.....	2-2
2.2.3 Other Phase 2 Treatments .....	2-6
2.3 Efficacy of Calcium Amendment of Peat Soils.....	2-12
2.3.1 Test Cells.....	2-15
2.3.2 Porta-PSTAs.....	2-20
2.3.3 Synthesis of Information on Soil Amendment Effects.....	2-20
2.4 TP Mass Removal Summary.....	2-21
2.4.1 Average $k_{1TP}$ Estimates.....	2-21
2.4.2 $k_{1TP}$ Correlations.....	2-22
<b>3 Community Development and Viability.....</b>	<b>3-1</b>
3.1 Introduction.....	3-1
3.2 Algal Taxonomic Composition .....	3-1
3.3 Periphyton Biomass and Chlorophyll Content .....	3-1
3.4 Periphyton Chemical Composition .....	3-3
3.5 Macrophytes.....	3-4
3.6 Consumer Populations.....	3-5
3.7 Community Metabolism/Productivity .....	3-5
<b>4 References .....</b>	<b>4-1</b>
<b>Appendix</b>	
A Meteorological Data	
B ENR PSTA Test Cells	
C Porta-PSTA Mesocosms	
D Key Date Summary	
E Data Trend Charts	

# Contents, continued

---

Exhibit	Page
1-1 Comparison of PSTA ENR South Test Cell Phase 1 and Phase 2 Treatments .....	1-3
1-2 Comparison of Porta-PSTA Mesocosm Phase 1 and Phase 2 Treatments .....	1-4
1-3 Summary of PSTA Field-Scale Experimental Treatments.....	1-5
1-4 Solar Energy Inputs to the PSTA Mesocosms During Phase 1 and 2 .....	1-6
1-5 Rainfall and Evapotranspiration at the PSTA Mesocosms During Phase 1 and 2.....	1-7
1-6 Input Concentrations of TP, TDP, TPP, DOP, and DRP in Source Water at the Two PSTA Mesocosm Sites.....	1-8
2-1 Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-3 (1x6 m Peat) and PP-4 (1x6 m Shellrock) for the Period-of-Record.....	2-3
2-2 Porta-PSTA $k_{ITP}$ Values in Treatments PP-3 (Peat) and PP-4 (Shellrock) for the Period-of-Record.....	2-3
2-3 Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-11 (3x6 m Shellrock) and PP-12 (3x6 m Peat) for the Period-of-Record.....	2-4
2-4 Porta-PSTA $k_{ITP}$ Values in Treatments PP-11 (3x6 m Shellrock) and PP-12 (3x6 m Peat) for the Period-of-Record .....	2-4
2-5 Porta-PSTA TP Inflow and Outflow Concentrations in Treatment PP-7 (1x6 m Sand) for the Period-of-Record .....	2-5
2-6 Porta-PSTA $k_{ITP}$ Values in Treatment PP-7 (Sand) for the Period-of-Record .....	2-5
2-7 PSTA Test Cell TP Inflow and Outflow Concentrations in Treatments STC-1/4 (Peat) and STC-2/5 (Shellrock) for the Period-of-Record .....	2-7
2-8 PSTA Test Cell $k_{ITP}$ Values in Treatments STC-1/4 (Peat) and STC-2/5 (Shellrock) for the Period-of-Record.....	2-7
2-9 PSTA Test Cell TP Concentration Trends in STC-3/6 (Shellrock with Dry-down) for the Period-of-Record.....	2-8
2-10 PSTA Test Cell $k_{ITP}$ Values in Treatment STC-3/6 (Shellrock with Dry-out) for the Period-of-Record .....	2-8
2-11 Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-4 (1x6 m Shellrock) and PP-14 (1x6 m Limerock) for Phase 2 .....	2-9
2-12 Porta-PSTA $k_{ITP}$ Values in Treatments PP-4 (Shellrock) and PP-14 (Limerock) for Phase 2 .....	2-9
2-13 Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-7 (Sand) and PP-17 (Sand Rinsed with HCl) for Phase 2 .....	2-10
2-14 Porta-PSTA $k_{ITP}$ Values in Treatments PP-7 (Sand) and PP-17 (Sand Rinsed with HCl) for Phase 2 .....	2-10
2-15 Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-18 (No Substrate) and PP-19 (Aquamat) for Phase 2.....	2-11
2-16 Porta-PSTA $k_{ITP}$ Values in Treatments PP-18 (No Substrate) and PP-19 (Aquamat) for Phase 2.....	2-11

# Contents, continued

---

Exhibit	Page
2-17 Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-4 (Shellrock) and PP-15 (Shellrock with Recirculation) for Phase 2.....	2-13
2-18 Porta-PSTA $k_{1TP}$ Values in Treatments PP-4 (Shellrock) and PP-15 (Shellrock with Recirculation) for Phase 2.....	2-13
2-19 TP Inflow and Outflow Concentrations in Test Cell Treatment STC-6 (Shellrock with Dry-out) and Porta-PSTA Treatment PP-16 (Shellrock with Dry-out) for Phase 2 .....	2-14
2-20 PSTA $k_{1TP}$ in Test Cell Treatment STC-6 (Shellrock with Dry-out) and Porta-PSTA Treatment PP-16 (Shellrock with Dry-out) for Phase 2.....	2-14
2-21 SFWMD PSTA Research and Demonstration Project Amended Peat Soils Data Summary .....	2-16
2-22 Average Monthly TP Outflow Concentrations in the PSTA Test Cells Peat Soil Treatments with and without Lime Amendments .....	2-17
2-23 Cumulative TP Mass Removed in the PSTA Test Cells Peat Soil Treatments with and without Lime Amendments.....	2-17
2-24 Average Monthly $k_{1TP}$ in the PSTA Test Cells Peat Soil Treatments with and without Lime Amendments .....	2-18
2-25 Average Monthly TP Outflow Concentrations in the Porta-PSTA Peat Soil Treatments with and without Lime Amendments .....	2-18
2-26 Cumulative TP Mass Removed in the Porta-PSTA Peat Soil Treatments with and without Lime Amendments.....	2-19
2-27 Average Monthly $k_{1TP}$ in the Porta-PSTA Peat Soil Treatments with and without Lime Amendments.....	2-19
2-28 Phase 2 PSTA Performance Summary .....	2-22
2-29 Relationship Between Outflow Dissolved Oxygen and $k_{1TP}$ for the PSTA Mesocosms for the Period-of-Record .....	2-24
2-30 Relationship Between Inflow Calcium and $k_{1TP}$ for the PSTA Mesocosms for the Period-of-Record .....	2-25
2-31 Relationship Between Inflow TP and $k_{1TP}$ for the PSTA Mesocosms for the Period-of-Record .....	2-26
2-32 Relationship Between Inflow HLR and $k_{1TP}$ for the PSTA Mesocosms for the Period-of-Record .....	2-27
2-33 Relationship Between Inflow TP Mass Loading Rate and $k_{1TP}$ for the PSTA Mesocosms for the Period-of-Record .....	2-28
3-1 Average Phase 2 PSTA Periphyton Community Data - Algal Populations.....	3-2
3-2 Average Phase 2 PSTA Periphyton Community Data - Biomass, Chlorophyll, and Chemistry .....	3-3
3-3 Phase 2 PSTA Macrophyte Cover and Biomass Data for August 2000 .....	3-5
3-4 Snails Collected in the Porta-PSTA Mesocosms, July 2000.....	3-6
3-5 Diffusion Rate Measurements in the PSTA Mesocosms .....	3-7
3-6 PSTA Community Metabolism Data for August 2000 .....	3-8

# Abbreviations and Acronyms

---

$\mu\text{g/L}$	microgram(s) per liter
cm	centimeter(s)
cm/s	centimeter(s) per second
CR	community respiration
DO	dissolved oxygen
DOP	dissolved organic phosphorus
DRP	dissolved reactive phosphorus
EAA	Everglades Agricultural Area
ENR	Everglades Nutrient Removal
ET	evapotranspiration
ft	foot (feet)
gpm	gallon(s) per minute
GPP	gross primary production
HLR	hydraulic loading rate
in	inch (inches)
m/y	meter(s) per year
mg/kg	milligram(s) per kilogram
MJ/M <sup>2</sup> /d	megajoules per square meter per day
mt/ha	metric tonnes per hectare
NPP	net primary production
O <sub>2</sub> /m <sup>2</sup> /hr	oxygen per square meter per hour
P	phosphorus
PAR	photosynthetically active radiation
POR	period of record
PP	porta-PSTA
PSTA	periphyton-based stormwater treatment area
SRP	Scientific Review Panel
STA	stormwater treatment area
STSOC	Supplemental Technology Standards of Comparison
TC	Test Cell
TDP	total dissolved phosphorus
TIP	total inorganic phosphorus
TKN	total Kjeldahl nitrogen
TP	total phosphorus
TPP	total particulate phosphorus

# Executive Summary

---

The South Florida Water Management District (District) is conducting research focused on potential advanced treatment technologies to support reduction of phosphorus (P) loads in surface waters entering the remaining Everglades. Periphyton-based stormwater treatment areas (PSTAs) are one of the advanced treatment technologies being researched by the District.

Studies are being conducted in three of the south ENR Test Cells (PSTA Test Cells) and in 24 portable PSTA mesocosms (Porta-PSTAs). Phase 1 of this research project began in the spring of 1999 and ended in March 2000. Information collected during that project period was summarized in the *Phase 1 Summary Report* (CH2M HILL, August 2000). Phase 2 of the project included continuing monitoring of the 27 mesocosms operated during Phase 1. Based on Phase 1 data analysis and input from the STA Scientific Review Panel (SRP), some of the Phase 1 treatments were continued unchanged into Phase 2, while other new treatments replaced the other Phase 1 treatments. Phase 2 research in the STA Test Cells will continue until March 2001. Phase 2 research in the Porta-PSTAs ended in early October 2000. Supplemental mass balance (destructive) sampling of selected Porta-PSTA mesocosms was conducted in February 2001, and results will be reported in the project final report. Phase 2 research also will be conducted in pilot-scale mesocosms currently under construction (Field-Scale PSTAs). Construction is expected to be complete and operations started at this mesocosm level in early 2001.

The STA Test Cell treatments were modified at the end of Phase 1 as follows:

- Average water depth was dropped in all three treatments from 60 to 30 centimeters (cm)
- Volunteer emergent macrophytes (primarily cattails and hydrilla) were removed from the peat-based cell and the peat was amended with calcium hydroxide to attempt to trap P fluxing from the peat soils during system startup after re-flooding
- A new water regime was established in one of the two shellrock treatments to provide a full dryout of the plant communities and sediments

Analogous Porta-PSTA treatments were also modified as described above for the Test Cells, and additional new treatments included:

- Use of limerock as an alternative calcium-rich substrate to shellrock in one treatment
- Acid wash of sand soils to eliminate release of soluble P
- Addition of re-circulation pumps in one of the shellrock treatments to assess the effects of a higher water velocity
- Removal of all soils from two tanks with addition of a synthetic periphyton-growth substrate (Aquamat) to one of the non-soil controls

This report provides an interim summary of the data collected from the PSTA Test Cells and the Porta-PSTA mesocosms during the first 6 to 7 months of Phase 2 (Phase 2 operations started in mid-April 2000, and some data are analyzed through October 2000). A more detailed data analysis will be prepared when Phase 2 research is complete.

Interim Phase 2 findings from the District's PSTA Research and Demonstration Project are summarized as follows:

- Total insolation averaged 21.4 megajoules (MJ) per square meter per day ( $m^2/d$ ) for the period and photosynthetically active radiation averaged 34.7 Einsteins per  $m^2/d$ . Sunlight inputs are clearly seasonal based on the latitude and the presence of cloud cover.
- The total rainfall for the Phase 2 period was 60.5 cm (23.82 in), which is equal to approximately 0.33 cm/d, while estimated evapotranspiration (ET) was 82.1 cm (32.32 in), or 0.45 cm/d (0.13 in/d). There was a slight net ET water loss – 0.12 cm/d (0.05 in/d) – to the atmosphere from the PSTA mesocosms estimated during this Phase 2 research period.
- The average Phase 2 total phosphorus (TP) inflow concentration was approximately 24 micrograms per liter ( $\mu g/L$ ) at the PSTA Test Cells and 31  $\mu g/L$  at the Porta-PSTAs. Considerable variation of inflow TP was observed at both sites with markedly different seasonal patterns at the two research locations.
- Higher TP treatment performance was typically demonstrated by shellrock soil Porta-PSTAs. The lowest average TP outflow concentration for this research phase (12  $\mu g/L$ ) was achieved by the shellrock Test Cell with stable water regime (STC-5). For the Phase 2 period from April to October 2000, the highest average TP one-parameter removal rate constants ( $k_{1TP}$ ) were measured in shellrock and sand Porta-PSTAs (20 to 22 meters per year [ $m/y$ ]). Peat-based PSTA mesocosms achieved average Phase 2 outflow TP concentrations as low as 19  $\mu g/L$  and  $k_{1TP}$  values as high as 15  $m/y$ .
- There was no apparent detrimental effect of dryout on outflow TP concentration. The value for  $k_{1TP}$  rose quickly following re-flooding and remained relatively high until the end of the Phase 2 period. The Phase 2 average  $k_{1TP}$  for this cell was 13.8  $m/y$ , but averaged more than 25  $m/y$  for the last 4 months of Phase 2.
- Limerock soil mesocosms performed approximately the same as shellrock soil mesocosms in terms of TP treatment.
- Rinsing sand soils with dilute HCl had no apparent measurable effect on either average outflow TP or TP mass removal rate.
- Mesocosms without soil performed approximately the same as shellrock mesocosms. Addition of Aquamat, a synthetic periphyton growth substrate, in one mesocosm improved TP removal performance compared to the non-soil control without Aquamat, but remained comparable to treatment performance in shellrock and sand mesocosms.
- Re-circulation was used to examine the effects of higher flow velocity in Porta-PSTA mesocosms. Other than an initial negative effect on performance when the pumps were

turned on, there was no measurable difference in performance as a result of higher flow velocity at this research scale.

- A 2-month dryout of the Porta-PSTA and Test Cell mesocosms in late spring of 2000 did not significantly degrade performance for TP mass removal and outflow concentration following PSTA re-hydration. Dryout of the PSTA Test Cell treatment (STC-6) was more complete than for the Porta-PSTA treatment. Nevertheless, this larger-scale mesocosm performed better for TP removal than the smaller unit after the dry-out period.
- Soil disturbance in the peat-based PSTA Test Cell prior to the beginning of Phase 2 resulted in elevated TP outflow concentrations and negative mass removals following system startup for Phase 2. This disturbance was a result of plant removal and addition of hydrated lime intended to reduce the release of soluble P. Results for the same treatment at the Porta-PSTA scale did not duplicate this reduced performance, probably because of the reduced level of soil disturbance at this smaller scale (plants were pulled and lime added from outside the fiberglass tanks rather than by walking in the peat). Longer-term effects of liming did not demonstrate a benefit at the Test Cell scale, but suggested better TP reduction at the Porta-PSTA scale.
- Preliminary correlations were made between a number of treatment variables and  $k_{TP}$ . Correlations for calcium and dissolved oxygen (DO) were poor, but increasing correlation coefficients were found for hydraulic loading rate (HLR), TP inflow concentration, and TP mass loading rate. It is likely that  $k_{TP}$  will have to be corrected by using this correlation for estimating PSTA land area needed for meeting a range of inflow TP loads. Other corrections that will be used include a background TP estimate,  $C^*$ , and use of the tanks-in-series model.
- A total of 191 different algal taxa were identified in PSTA periphyton samples collected during Phase 2. The number of species observed in the Phase 2 PSTA Test Cells and Porta-PSTAs were 115 and 180, respectively.
- Dominant algal taxa were in the blue-green (Cyanophyceae), diatom (Bacillariophyceae), and green (Chlorophyta) algal groups. The highest algal cell counts and biovolumes were measured in the non-soil control tank (PP-18). The lowest algal populations were in two of the peat treatments (PP-12 and PP-13). All mesocosms had relatively high algal diversities, with average Shannon-Weiner diversity indices between 2.9 and 3.4, and from 21 to 31 algal species per count. Evenness in all samples averaged between 0.65 and 0.73.
- Average Phase 2 periphyton dry weight biomass varied from a low of 273 grams per square meter ( $g/m^2$ ) in the dry-down PSTA Test Cell (STC-6) to 1,990  $g/m^2$  in the calcium-amended peat Porta-PSTA (PP-13). Ash-free dry weight biomass varied from a low of 86  $g/m^2$  to a high of 1,041  $g/m^2$  for these two extremes. The peat-based mesocosms had the highest estimated periphyton biomasses (average dry weight of 1,122  $g/m^2$  across all peat treatments), while the shellrock treatments averaged 578  $g/m^2$ . The peat biomass estimates are likely high because of the unavoidable inclusion of some peat sediment in the samples. The average limerock biomass was slightly lower at 416  $g/m^2$  (starting from zero at the beginning of the Phase 2 period),

and the sand and non-substrate control mesocosms had biomass levels between the shellrock and peat mesocosms.

- Average Phase 2 corrected chlorophyll *a* ranged from 86 to 246 milligrams per square meter ( $\text{mg}/\text{m}^2$ ) with no clear trends between treatments. Pheophytin estimates were typically highest in the peat mesocosms, indicating that these periphyton communities have a greater fraction of senescent algae than the other treatments.
- Calcium content was relatively consistent across treatments with no clear trend, ranging from 50 to 259  $\text{g}/\text{m}^2$ . Average Phase 2 periphyton TP concentrations were typically highest in the peat and shellrock mesocosms. Total inorganic phosphorus (TIP) concentrations were more variable between treatments, with the lowest values measured in the sand Porta-PSTA tanks and in one of the shellrock Test Cells (STC-5). Total Kjeldahl nitrogen (TKN) concentrations were typically, but not consistently, highest in the peat-based mesocosms.
- In the Porta-PSTAs with plants, emergent macrophytes occupied from 3 to 83 percent by cover, and submerged aquatic plants occupied from 0 to 26 percent. Emergent macrophyte cover in the PSTA Test Cells ranged from 14 to 48 percent, and submerged macrophyte cover ranged from 68 to 100 percent. The lowest macrophyte cover estimates were generally in the new treatments that had been started in April 2000. Macrophyte dry weight biomass estimates for August 2000 ranged from 0 to 471  $\text{g}/\text{m}^2$ . Stem counts in the Porta-PSTAs ranged from 0 to 385 stems/ $\text{m}^2$ .
- The total number of harvested snails in the Porta-PSTA treatments during Phase 2 ranged from 0 to approximately 44 per  $\text{m}^2$ . The highest snail densities were observed in shellrock treatments (PP-4 and PP-16), and in some cases significant between-replicate variability in grazer presence occurred.
- Gross primary productivity (GPP) during August 2000 ranged from a low of approximately 1.6  $\text{g O}_2/\text{m}^2/\text{d}$  in the Aquamat control treatment (PP-19) to a high of 7.7  $\text{g O}_2/\text{m}^2/\text{d}$  in the dryout PSTA Test Cell treatment (STC-6). GPP was typically between 3 and 4  $\text{g O}_2/\text{m}^2/\text{d}$  in most treatments.
- Community respiration (CR) ranged from a low of approximately 1.1  $\text{g O}_2/\text{m}^2/\text{d}$  in the Aquamat treatment, to a high of approximately 6.8  $\text{g O}_2/\text{m}^2/\text{d}$  in the dryout PSTA Test Cell. The ratio of GPP to CR (P/R ratio) varied from a low of 0.55 in treatment PP-3 (peat) to a high of 1.42 in the Aquamat control (PP-19).
- Photosynthetic efficiencies ranged from a low of approximately 1 percent in the Aquamat control to a high of approximately 4.5 percent in the dry-out PSTA Test Cell mesocosm.

Phase 2 operation and monitoring of the Test Cell PSTA mesocosms is scheduled to continue through March 2001. Routine monitoring in the Porta-PSTAs was ended in early October 2000, and a final inventory of biomass, calcium, TP, and TN in selected mesocosms was made in early 2001. Monitoring of the Field-Scale PSTAs is expected to begin in early 2001 and continue for several months, and possibly longer.

Results from Phase 2 of the PSTA Research and Demonstration Project have helped to characterize the growth and ecology of periphyton and macrophytes on differing soils, and have identified attainable outflow TP concentrations and effective TP net removal rate constants based on the experimental conditions established in the mesocosm systems studied. Continued monitoring of the PSTA experimental systems and detailed data analysis at the end of Phase 2 will summarize the effects of treatment variables, seasonal variability, and ecosystem maturity on PSTA TP removal performance.

## SECTION 1

# Project Background

---

## 1.1 Introduction

The South Florida Water Management District (District) is conducting research focused on potential advanced treatment technologies to support reduction of phosphorus (P) loads in surface waters entering the remaining Everglades. Periphyton-based stormwater treatment areas (PSTAs) are one of the advanced treatment technologies being researched by the District. The PSTA concept was proposed for P removal from Everglades Agricultural Area (EAA) waters by Doren and Jones (1996) and further described and evaluated by Kadlec (1996, 1998) and Kadlec and Walker (1996). Prior to initiation of the District's PSTA project in July 1998, detailed research to evaluate treatment performance issues and the long-term viability of the PSTA approach to P reduction in EAA surface waters had not been performed.

The two phases of the PSTA Research and Demonstration Project are described in detail in the revised *PSTA Research Plan* (CH2M HILL, February 2000). In brief, the first phase of the study provided basic research data needed to better understand whether the PSTA concept should continue to be investigated as a part of the solution for Everglades restoration. Phase 1 research was performed through field-based mesocosm experiments located within the District's Everglades Nutrient Removal (ENR) Project. Phase 1 PSTA studies were conducted in 24 portable PSTA mesocosms (Porta-PSTAs), and in three of the south ENR Test Cells. Phase 1 research was conducted between February 1999 and March 2000, and has been previously reported by CH2M HILL (August 2000).

Phase 2 of the PSTA Research and Demonstration Project began in April 2000 and is currently scheduled to continue until June 2001. Based on the results of Phase 1, it was decided to extend the Porta-PSTA research by 6 months and to continue PSTA Test Cell research for a second year. Thus, Phase 2 includes continued research in the Porta-PSTAs and in the ENR Test Cells, as well as startup and operation of the Field-Scale PSTA demonstration cells located near Stormwater Treatment Area 2 (STA-2). During the fourth quarter of 2000, the District determined that construction and testing of a peat-based pilot PSTA comparable in dimensions and operating conditions to the three cells originally planned was needed. A contract amendment to formally add evaluations of P treatment performance in this fourth Field-Scale PSTA to the Phase 2 studies is planned.

Phase 2 PSTA research has been expedited in light of the high level of interest in accelerating the overall schedule for evaluating and integrating advanced treatment technologies into the STAs. Operation and monitoring of the Porta-PSTAs was completed in early October 2000. PSTA Test Cell operation and monitoring is scheduled to continue until March 2001. Construction of the four Field-Scale pilot PSTA cells is complete, and monitoring is scheduled to begin in May 2001.

This document is an interim report prepared under Task 10 of the PSTA study program contract held by CH2M HILL. It provides a summary of progress on the PSTA Research Project for the first 6 to 7 months of Phase 2, including mesocosm operations from April through October 2000. Brief summaries of updated key findings are provided in Sections 2 and 3. Detailed data summaries are included in the appendices as follows:

- Appendix A-Meteorological Data
- Appendix B-ENR PSTA Test Cells
- Appendix C-Porta-PSTA Mesocosms
- Appendix D-Key Date Summary
- Appendix E-Data Trend Charts

## **1.2 Summary of Phase 2 Experimental Design and Treatments**

### **1.2.1 South ENR Test Cells**

The District assigned three South ENR Test Cells to the PSTA Research and Demonstration Project. During final construction, substrate within these PSTA Test Cells was modified by the District by placing the following layers of substrate over the cell liner:

- **Test Cell 13**-2.5 feet (ft) of sand surcharge plus 1.0 ft of shellrock (locally mined) plus 1.0 ft of peat (taken from area of STA 1W, Cell 5 – unflooded, former agriculturally worked lands)
- **Test Cell 8**-3.5 ft of sand surcharge plus 1.0 ft of shellrock (locally mined)
- **Test Cell 3**-3.5 ft of sand surcharge plus 1.0 ft of shellrock (locally mined)

Three treatments were tested in the Test Cells during Phase 1. In March 2000, changes were made to the Test Cells, such as soil amendments, water regime, and water depth. The treatments were renamed for Phase 2 with monitoring to continue through March 2001. Exhibit 1-1 summarizes the six treatments tested in the PSTA Test Cells.

### **1.2.2 Porta-PSTA Mesocosms**

Twenty-four Porta-PSTA mesocosm units were fabricated of fiberglass offsite and delivered to the South ENR Supplemental Technologies Research Compound. Twenty-two of the fiberglass tanks are 6 meters long by 1 meter wide by 1 meter deep. The remaining two tanks are 3 meters wide to allow assessment of mesocosm configuration effects.

Exhibit 1-2 summarizes the 24 treatments tested in the Porta-PSTA mesocosms. Twelve treatments were tested during Phase 1. Six mesocosms were altered in March 2000 to allow for testing of six additional treatments during Phase 2, while six remained unaltered for continued monitoring. These treatments include differences in antecedent soil types, water depth, water regime, plant communities, flow velocities, soil amendments, and mesocosm size.

**EXHIBIT 1-1**

Comparison of PSTA ENR South Test Cell Phase 1 and Phase 2 Treatments

	Phase 1	Phase 1 to Phase 2 Alterations	Phase 2
	Treatment 1		Treatment 4
TC 13	Substrate: Peat Depth: 60 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0093 Depth:Width Ratio: 0.02 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Vegetation herbicided and removed</li> <li>Cell floor wetted and peat soil amended with lime (7mt/ha)</li> <li>Cell reflooded, but operated at 30 cm</li> <li>Vegetation replanted</li> <li>Cell inoculated with periphyton</li> </ul>	Substrate: Peat + Ca Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0185 Depth:Width Ratio: 0.01 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
TC 8	Substrate: Shellrock Depth: 60 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0093 Depth:Width Ratio: 0.02 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Water depth reduced to 30 cm</li> <li>No other changes made</li> </ul>	Substrate: Shellrock Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0185 Depth:Width Ratio: 0.01 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
TC 3	Substrate: Shellrock Depth: 0- 60 cm HLR (cm/d): 0- 12 Average Velocity (cm/s): 0.0093 Depth:Width Ratio: 0.02 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Two complete dry-outs scheduled for the cell with subsequent reflooding</li> <li>Maximum water depth of 30 cm</li> </ul>	Substrate: Shellrock Depth: 0- 30 cm HLR (cm/d): 0- 12 Average Velocity (cm/s): 0.0185 Depth:Width Ratio: 0.01 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>

### 1.2.3 Field-Scale Pilot PSTAs

The Field-Scale PSTA facilities were designed by the District, with technical input from the CH2M HILL PSTA team. The design includes three 5-acre cells. During the Scientific Review Panel (SRP) workshop in September 2000, discussions concluded that it would be advantageous to have a fourth, peat-based cell. The site design has been revised, and the final design includes a total wetted Field-Scale PSTA area of approximately 20 acres divided into four 5-acre PSTA cells.

The four Field-Scale PSTAs have differing design criteria, which are summarized as follows:

- **Cell 1:** 5 acres with a length:width ratio of 5:1 (length = 1,040 ft, width = 200 ft); limerock fill over peat soils; single inlet and outlet points in transverse deep water zones; inlet pumping capacity of approximately 450 gallons per minute (gpm); outlet variable height weir with flow by gravity; embankments 4.5 ft above grade with 2:1 (horizontal:vertical) limerock slopes; planted with bands of low density of spikerush.
- **Cell 2:** 5 acres with a length:width ratio of 45:1 (length = 3,120 ft, width = 70 ft); limerock fill over peat soils; single inlet and outlet points in transverse deep water zones; additional transverse deep zones at 1/3 and 2/3 points inlet pumping capacity of 450 gpm; outlet variable height weir with flow by gravity; embankments 4.5 ft above grade with 2:1 limerock slopes; planted with bands of low density of spikerush.
- **Cell 3:** 5 acres with a length:width ratio of 5:1 (length = 1,040 ft, width = 200 ft); peat soils excavated to caprock; single inlet and outlet points in transverse deep water zones; inlet pumping capacity of 450 gpm; outlet variable height weir with flow pumped up to

**EXHIBIT 1-2**

Comparison of Porta-PSTA Mesocosm Phase 1 and Phase 2 Treatments

	Phase 1	Phase 1 to Phase 2 Alterations	Phase 2
Porta-PSTAs 9, 11, 18	<b>Treatment 1</b>  Substrate: Peat Depth: 60 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0007 Depth:Width Ratio: 0.6 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Tanks drained and vegetation removed</li> <li>Sediment wetted and peat soil amended with lime (7mt/ha)</li> <li>Vegetation replanted</li> <li>Tank reflooded, but operated at 30 cm</li> <li>Tank inoculated with periphyton</li> </ul>	<b>Treatment 13</b>  Substrate: Peat + Ca Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
	<b>Treatment 2</b>  Substrate: Shellrock Depth: 60 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0007 Depth:Width Ratio: 0.6 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Tanks drained and vegetation removed</li> <li>Shellrock removed and tank rinsed with dilute HCl</li> <li>20 cm of washed limerock added to tank</li> <li>Tank replanted with spikerush</li> <li>Tank reflooded, but operated at 30 cm</li> <li>Tank inoculated with periphyton</li> </ul>	<b>Treatment 14</b>  Substrate: Limerock Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
Porta-PSTAs 12, 14, 17	<b>Treatment 3</b>  Substrate: Peat Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Continue routine monitoring with no changes</li> </ul>	<b>Treatment 3</b>  Substrate: Peat Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
	<b>Treatment 4</b>  Substrate: Shellrock Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Continue routine monitoring with no changes</li> </ul>	<b>Treatment 4</b>  Substrate: Shellrock Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
Porta-PSTAs 2, 13, 16	<b>Treatment 5</b>  Substrate: Shellrock Depth: 60 HLR (cm/d): 12 Average Velocity (cm/s): 0.0007 Depth:Width Ratio: 0.6 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>HLR reduced to 6 cm/d</li> <li>Water depth reduced to 30 cm</li> <li>Recirculation pumps installed to increase velocity to 0.5 cm/s</li> </ul>	<b>Treatment 15</b>  Substrate: Shellrock Depth: 30 cm HLR (cm/d): (recirc) Average Velocity (cm/s): 0.5 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
	<b>Treatment 6</b>  Substrate: Shellrock Depth: 0- 60cm HLR (cm/d): 0- 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0- 6 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>One complete dry out scheduled with subsequent reflooding</li> <li>Variation in water regime scheduled</li> <li>Maximum water depth reduced to 30 cm</li> </ul>	<b>Treatment 16</b>  Substrate: Shellrock Depth: 0- 30 cm HLR (cm/d): 0- 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0- 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
Porta-PSTA 19	<b>Treatment 7</b>  Substrate: Sand Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Continue routine monitoring with no changes</li> </ul>	<b>Treatment 7</b>  Substrate: Sand Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
	<b>Treatment 8</b>  Substrate: Sand Depth: 60 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0007 Depth:Width Ratio: 0.6 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Tank drained and vegetation removed</li> <li>Sand thoroughly washed with dilute HCl to remove available P</li> <li>Tank rinsed</li> <li>Tank replanted with spikerush</li> <li>Tank reflooded, but operated at 30 cm</li> <li>Tank inoculated with periphyton</li> </ul>	<b>Treatment 17</b>  Substrate: Sand- HCl Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
Porta-PSTA 21	<b>Treatment 9</b>  Substrate: Peat- Aquashade Depth: 60 HLR (cm/d): 6 Average Velocity (cm/s): 0.0007 Depth:Width Ratio: 0.6 Vegetation: None	<ul style="list-style-type: none"> <li>Tank drained and substrate removed</li> <li>Tank thoroughly rinsed with dilute HCl</li> <li>Tank rinsed</li> <li>Tank reflooded, but operated at 30 cm</li> <li>Tank inoculated with periphyton</li> </ul>	<b>Treatment 18</b>  Substrate: None Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Utricularia</i>
	<b>Treatment 10</b>  Substrate: Shellrock- Aquashade Depth: 60 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0007 Depth:Width Ratio: 0.6 Vegetation: None	<ul style="list-style-type: none"> <li>Tank drained and substrate removed</li> <li>Tank thoroughly rinsed with dilute HCl</li> <li>Tank rinsed</li> <li>Tank reflooded, but operated at 30 cm</li> <li>Synthetic substrate (Aquamat) added</li> <li>Tank inoculated with periphyton</li> </ul>	<b>Treatment 19</b>  Substrate: None- Aquamat Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.3 Vegetation: Periphyton, <i>Utricularia</i>
Porta-PSTA 23	<b>Treatment 11</b>  Substrate: Shellrock Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.1 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Continue routine monitoring with no changes</li> </ul>	<b>Treatment 11</b>  Substrate: Shellrock Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.1 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>
	<b>Treatment 12</b>  Substrate: Peat Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.1 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>	<ul style="list-style-type: none"> <li>Continue routine monitoring with no changes</li> </ul>	<b>Treatment 12</b>  Substrate: Peat Depth: 30 cm HLR (cm/d): 6 Average Velocity (cm/s): 0.0014 Depth:Width Ratio: 0.1 Vegetation: Periphyton, <i>Eleocharis</i> , <i>Utricularia</i>

1,000 gpm; embankments 4.5 ft above grade with 2:1 limerock slopes; planted with bands of low density of spikerush.

- **Cell 4:** 5 acres with a length:width ratio of 5:1 (length = 1,040 ft, width = 200 ft); peat soils; single inlet and outlet points in transverse deep water zones; inlet pumping capacity of approximately 450 gpm; outlet variable height weir with flow by gravity; embankments 4.5 ft above grade with 2:1 (horizontal:vertical) limerock slopes; planted with bands of low density of spikerush.

Exhibit 1-3 provides a summary of design criteria and treatments for the four Field-Scale PSTAs.

#### **EXHIBIT 1-3**

Summary of PSTA Field-Scale Experimental Treatments

Treatment	Project Phase	Mesocosm Area (m <sup>2</sup> )	Substrate	Periphyton	Macrophytes	Water Depth (cm)	HLR (cm/d)	Average Velocity (cm/s)	Depth:Width Ratio	# Replicates
FS-1	2	20,790	Limerock/Peat	Yes	Yes	0-60	0-12	0.073	0.005	1
FS-2	2	20,790	Limerock/Peat	Yes	Yes	0-60	0-12	0.22	0.014	1
FS-3	2	20,790	Caprock	Yes	Yes	0-60	0-12	0.073	0.005	1
FS-4	2	20,790	Peat	Yes	Yes	0-60	0-12	0.073	0.005	1

## **1.3 Summary of Phase 2, and Research Timeline**

Phase 1 PSTA operational monitoring activities began with startup of the PSTA Test Cells on February 15, 1999. The Porta-PSTAs began operation on April 17, 1999. Phase 1 activities continued until March 2000. Phase 2 activities covered in this report extended from April 2000 to October 2000. Operations of the PSTA Test Cells and Porta-PSTAs generally followed the treatment guidelines summarized in Exhibits 1-1 and 1-2, respectively. Actual operating inflows and water depths are detailed in the *Phase 1 Summary Report* (CH2M HILL, August 2000) and in the appendices of this interim Phase 2 report. A detailed timeline of key operational dates for the Phase 1 and 2 PSTA research is included in Appendix D.

## **1.4 Environmental Forcing Functions**

External environmental forcing functions that have affected the growth and performance of the PSTA mesocosms at the Porta-PSTA (PP) and Test Cell (TC) scales include:

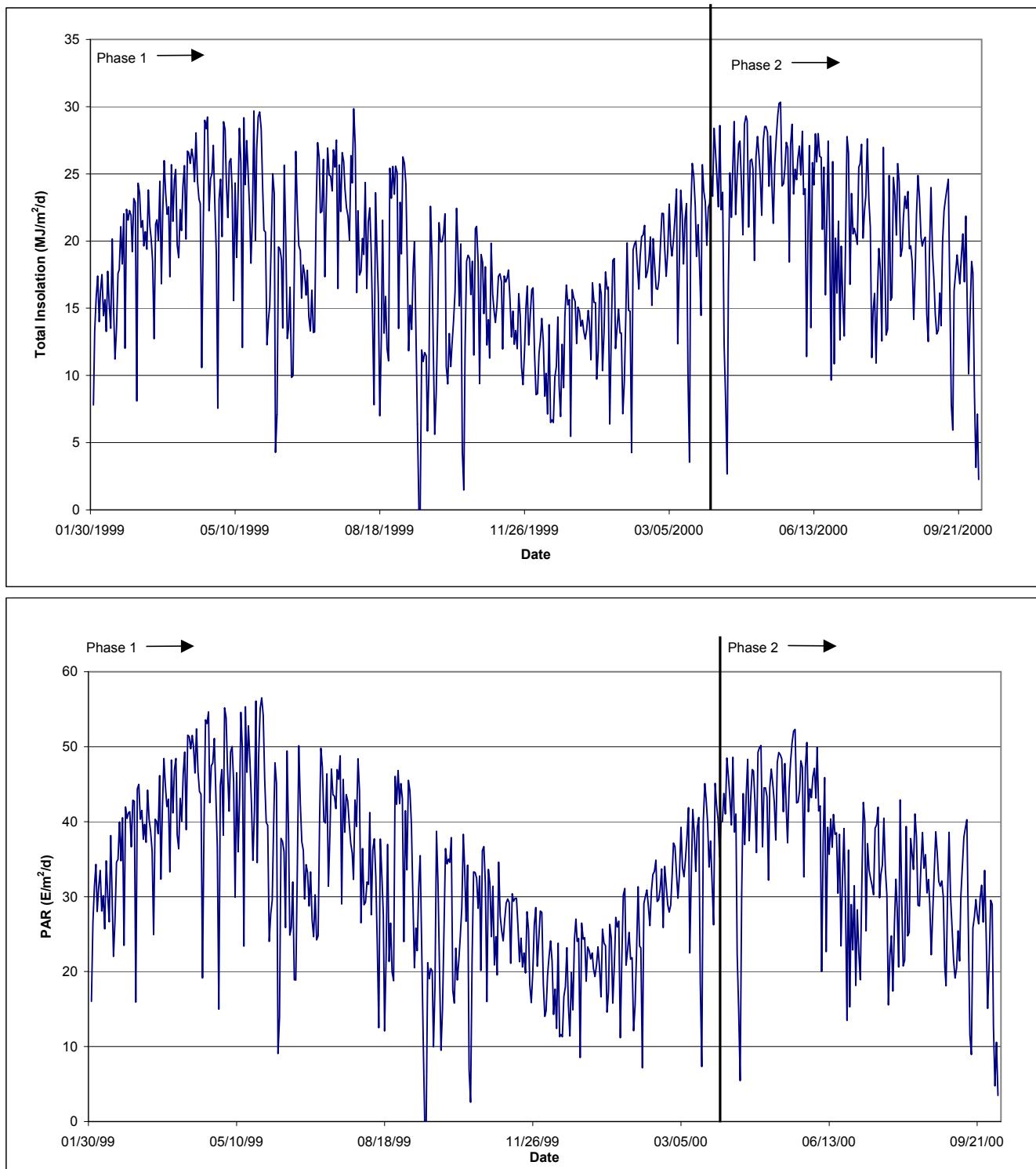
- Sunlight (measured as total insolation and photosynthetically active radiation [PAR])
- Rain inputs
- Evapotranspiration (ET) outputs
- Inflow P concentrations

The general history of each of these forcing functions for the period-of-record (POR) is presented in Exhibits 1-4 through 1-6.

Exhibit 1-4 compares the total insolation and PAR received at the project site during Phase 1 and the 6-month Phase 2 period of the PP study extension. Total insolation averaged

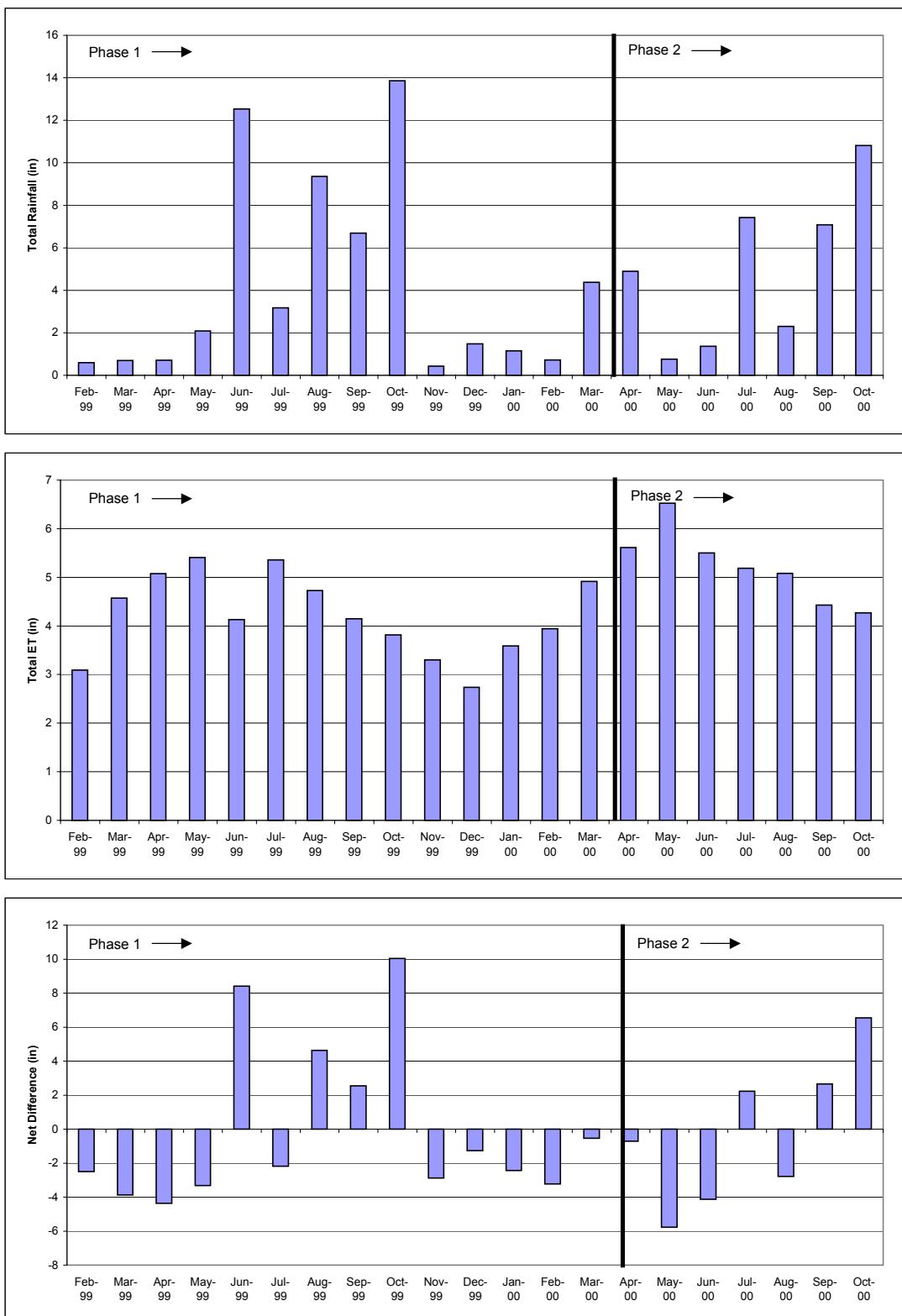
**EXHIBIT 1-4**

## Solar Energy Inputs to the PSTA Mesocosms During Phase 1 and 2



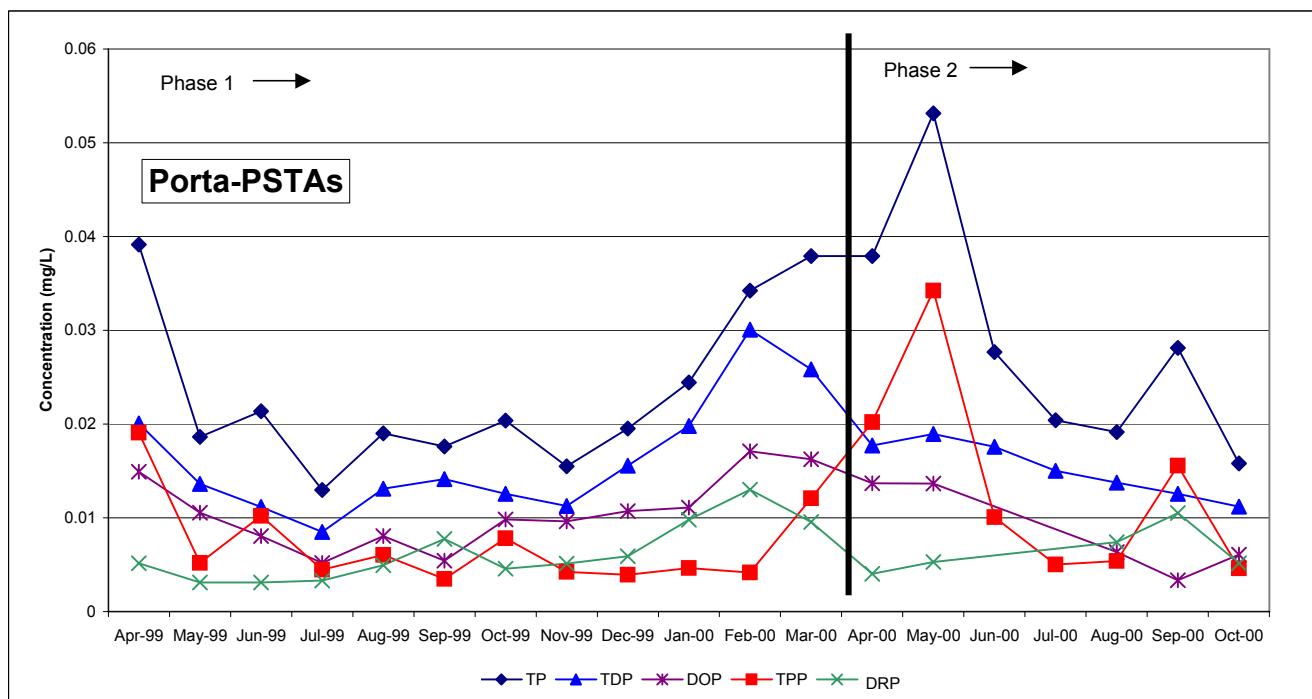
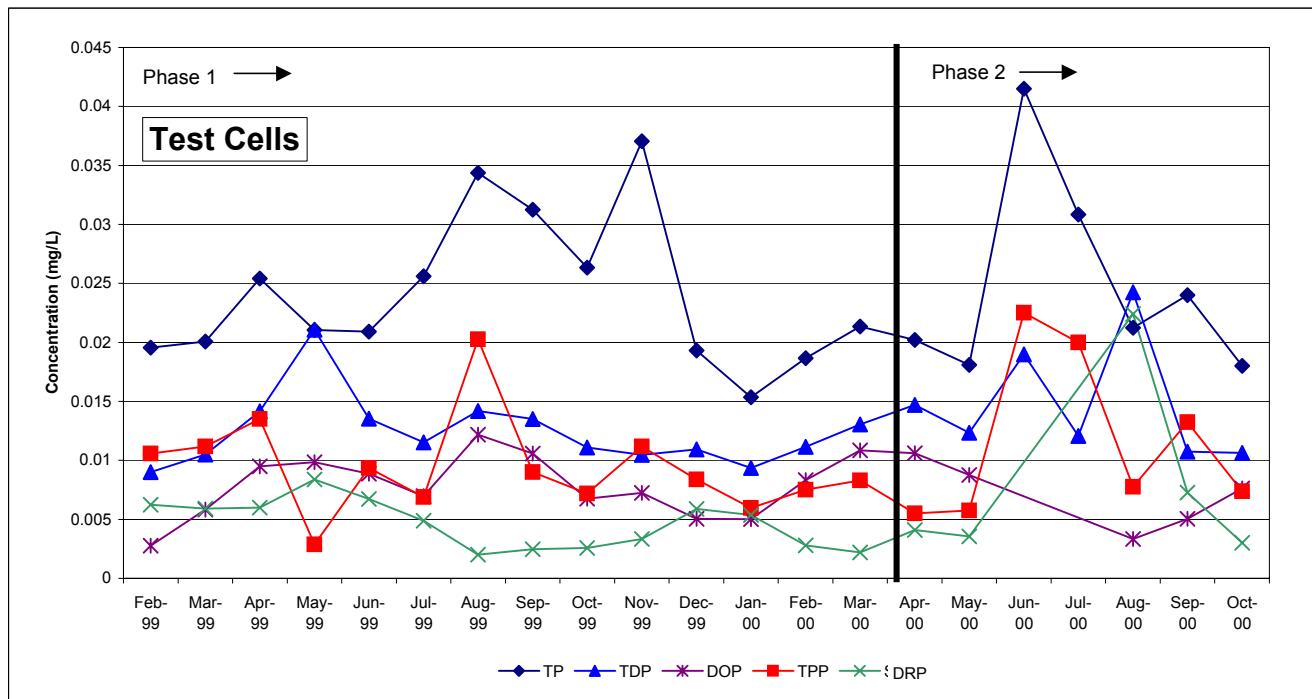
**EXHIBIT 1-5**

Rainfall and Evapotranspiration at the PSTA Mesocosms During Phase 1 and 2



**EXHIBIT 1-6**

Inflow Concentrations of TP, TDP, TPP, DOP, and DRP in Source Water at the Two PSTA Mesocosm Sites



## Notes:

TP = total phosphorus

TDP = total dissolved phosphorus

DOP = dissolved organic phosphorus

TPP = total particulate phosphorus

DRP = dissolved reactive phosphorus

21.4 megajoules (MJ) per m<sup>2</sup>/d and PAR averaged 34.7 Einsteins (E) per m<sup>2</sup>/d. Sunlight inputs are clearly seasonal based on the latitude and the presence of cloud cover.

Exhibit 1-5 compares the measured rainfall and estimated ET and their net difference. The total rainfall for the POR was 60.5 centimeters (cm), which is equal to approximately 0.33 cm/d (0.13 in/d), while ET was 82.1 cm (32.32 in), or 0.45 cm/d (0.13 in/d). These data indicate that there was a slight net ET water loss to the atmosphere (0.12 cm/d) [0.05 in/d] from the PSTA mesocosms estimated during this Phase 2 research period.

Exhibit 1-6 summarizes the measured concentrations of total phosphorus (TP), total dissolved phosphorus (TDP), total particulate phosphorus (TPP), dissolved organic phosphorus (DOP), and dissolved reactive phosphorus (DRP) in the inflows to the PSTA Test Cells and to the Porta-PSTA mesocosms during Phases 1 and 2. These P inputs were variable and were not consistently higher or lower at either site. The average Phase 2 TP inflow concentration was approximately 24 micrograms per liter ( $\mu\text{g}/\text{L}$ ) at the PSTA Test Cells and 31  $\mu\text{g}/\text{L}$  at the Porta-PSTAs. Considerable variation of inflow TP was observed at both sites with markedly different seasonal patterns at the two research locations.

## SECTION 2

# Phosphorus Removal Performance and Effectiveness

---

## 2.1 Introduction

This section provides a summary of key findings during Phase 2 from April through early October 2000. Results from the PSTA Test Cells and Porta-PSTAs are compared and contrasted to provide an interim status report on PSTA viability and effectiveness. Key issues addressed in this section include:

- TP concentration and  $k_{1TP}$  trends as a function of treatment and mesocosm scale
- Efficacy of calcium amendment of peat soils
- TP mass removals as a function of treatment and other factors
- PSTA ecological community viability

Detailed data supporting these summaries are included in the appendices. A more complete analysis and summary of all project findings will be provided in the PSTA Research and Demonstration Project final report.

## 2.2 TP Concentration and $k_1$ Trends

### 2.2.1 Phases 1 and 2 Porta-PSTA Treatment TP Time Series

Selected Porta-PSTA treatments were continued un-changed between Phase 1 and Phase 2. These included:

- PP-3 (1x6 m, peat, 30 cm)
- PP-4 (1x6 m, shellrock, 30 cm)
- PP-7 (1x6 m, sand, 30 cm)
- PP-11 (3x6 m, shellrock, 30 cm)
- PP-12 (3x6 m, peat, 30 cm)

Treatments PP-3 and PP-4 were each replicated three times, while the other treatments were not replicated.

Exhibit 2-1 provides a time series plot that compares Porta-PSTA treatments PP-3 and PP-4 for the entire 18-month operational period. The Phase 1 and 2 periods are demarcated on the graph. Inflow TP concentrations were relatively high during the beginning of Phase 2 and declined from near 40 µg/L in April 2000 to less than 20 µg/L in August 2000. Concentrations increased for a short period in September but then declined again by the end of the Porta-PSTA experiment. The average TP inflow concentration to these treatments during Phase 2 was 32 µg/L. Outflow concentrations from PP-3 (peat) were generally higher than for PP-4 (shellrock). The separation between the two treatments actually increased during Phase 2 compared to Phase 1. Average Phase 2 TP outflow concentrations during this period

were 19 µg/L for PP-3 and 15 µg/L for PP-4. However, the best of the three replicates in each of these treatments (Tanks 3 and 14) had identical average Phase 2 TP outflow concentrations of 14 µg/L.

Exhibit 2-2 includes the  $k_{1TP}$  time series data for Porta-PSTA treatments PP-3 and PP-4. TP removal rate constants have been consistently higher in the shellrock treatment than in the calcium-amended peat soil treatment during Phase 2. The Phase 2 average  $k_{1TP}$  values for PP-3 and PP-4 were 15.0 and 20.8 meters per year (m/y), respectively.

Exhibit 2-3 illustrates the TP time series for PP-11 and PP-12. These tanks also have shellrock and peat soils at 30 cm, and have been operated since the project began in April 1999. They are not replicated. Average TP inflow to these treatments was approximately 32 µg/L. Phase 2 average TP outflow concentrations were only slightly different between the two cells, at approximately 20 µg/L for the shellrock treatment and 21 µg/L for the peat soil treatment. These results are similar to the replicates in PP-3 and PP-4 that demonstrated the least amount of TP removal.

Exhibit 2-4 includes the  $k_{1TP}$  time series data for Porta-PSTA treatments PP-11 (shellrock) and PP-12 (peat). The Phase 2 average  $k_{1TP}$  values for PP-11 and PP-12 were 13.6 and 11.9 m/y, respectively.

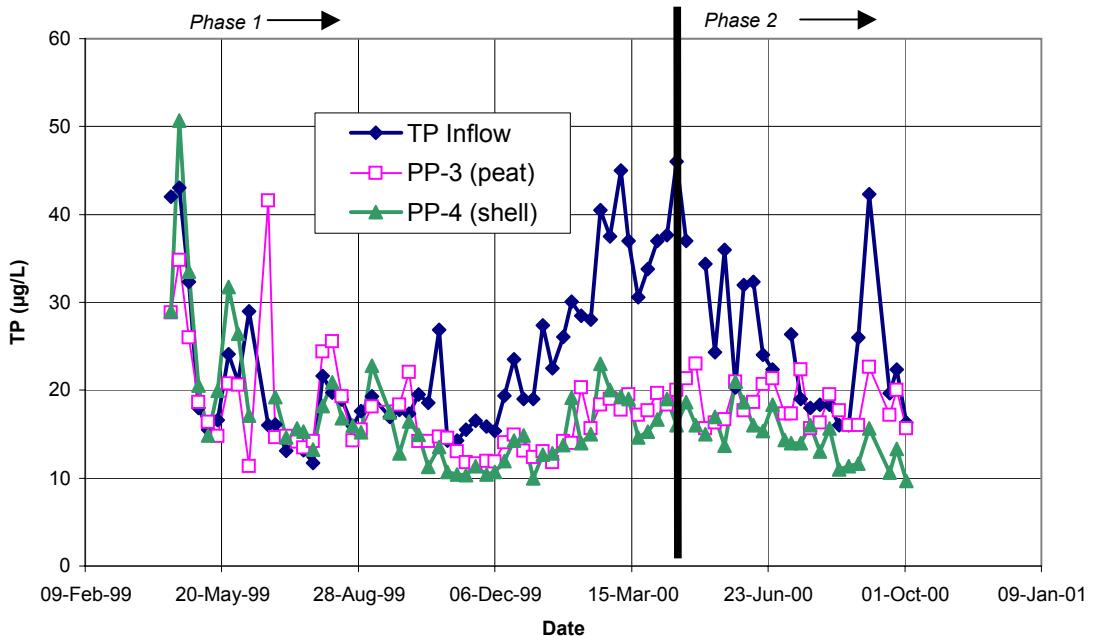
Exhibit 2-5 illustrates the TP time series for PP-7 (sand soils and 30 cm water depth since project initiation). The average inflow TP concentration for this treatment was 31 µg/L, and the outflow TP averaged 15 µg/L. Many of the Phase 2 outflow TP grab samples measured less than 15 µg/L for this treatment, but a few spikes near 25 µg/L were recorded.

Exhibit 2-6 includes the  $k_{1TP}$  time series data for Porta-PSTA treatment PP-7. The Phase 2 average  $k_{1TP}$  for PP-7 was 20.3 m/y.

## 2.2.2 Phases 1 and 2 Test Cell TP Time Series

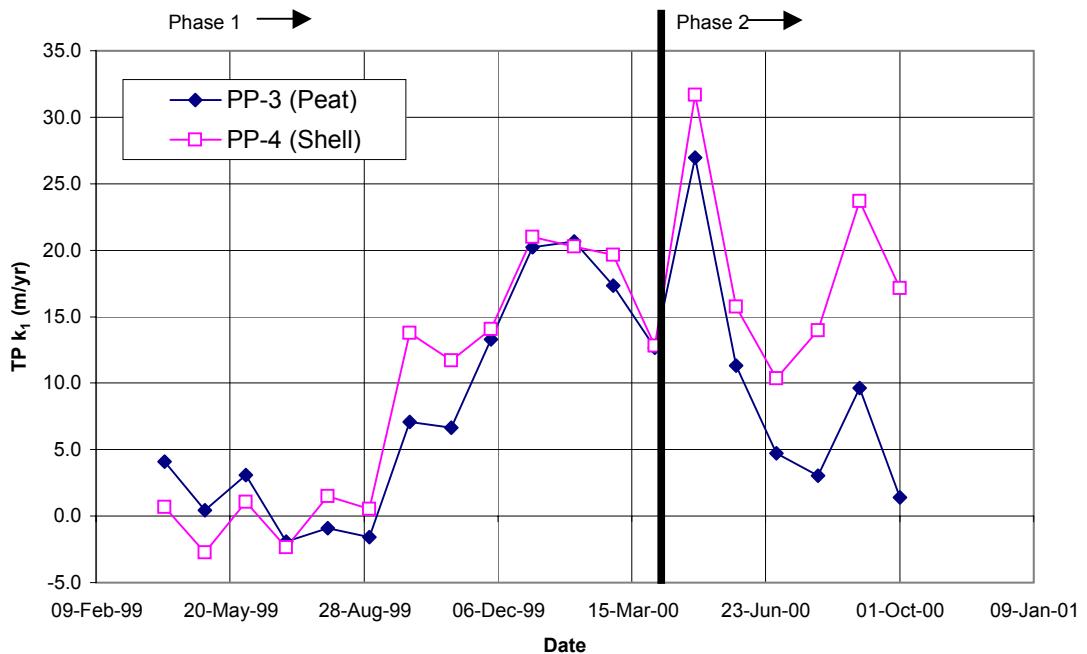
Exhibit 2-7 illustrates the TP time series data for the peat and shellrock Test Cell PSTAs operated at constant depth and HLR rates. The Phase 1 STC-1 became the Phase 2 STC-4 by eradicating macrophytes with herbicides, harvesting the dead biomass, amending the soil with hydrated lime, and lowering the mean water depth to 30 cm. These changes were made during March 2000, and Phase 2 operation effectively began in April 2000. The Phase 1 STC-2 became the Phase 2 STC-5 by lowering the water depth to 30 cm. The Phase 1 STC-3 became the Phase 2 STC-4, with a mean operational depth of 30 cm and a new dryout schedule.

Phase 2 average TP inflow concentration to these cells was approximately 24 µg/L. Treatment STC-5 (shellrock) continued its relatively low trend of outflow TP concentrations during Phase 2 with an average of 12 µg/L. Soil disturbance in STC-4 (peat) resulted in an immediate spike in outflow TP concentrations upon re-flooding despite the lime soil amendment. This concentration declined rapidly through most of Phase 2; however, average TP outflow concentration in STC-4 during the Phase 2 period was 35 µg/L. It is noteworthy that TP concentrations in the STC-4 outflow at the end of September 2000 were similar to those at the end of Phase 1.



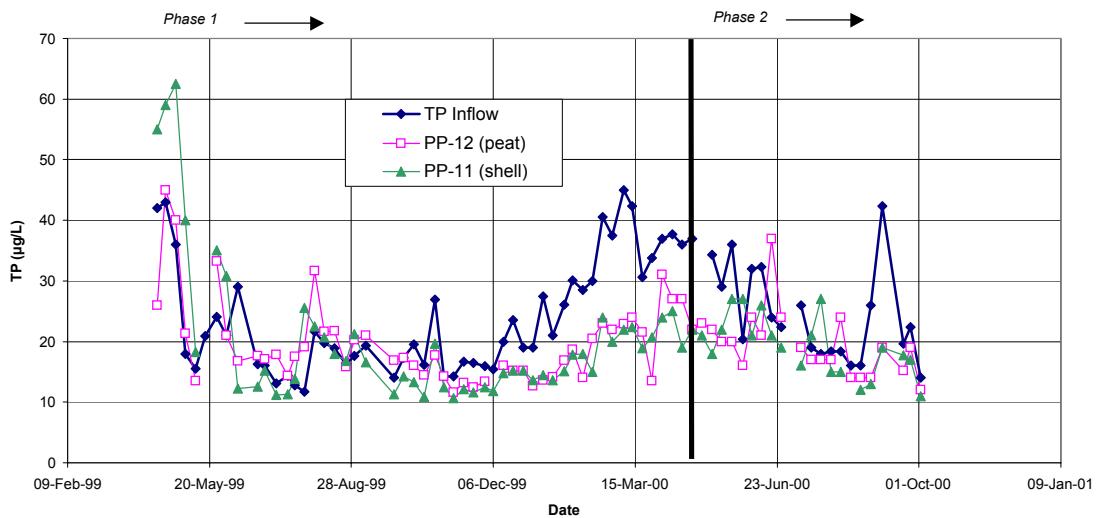
#### EXHIBIT 2-1

Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-3 (1x6 m Peat) and PP-4 (1x6 m Shellrock) for the Period-of-Record



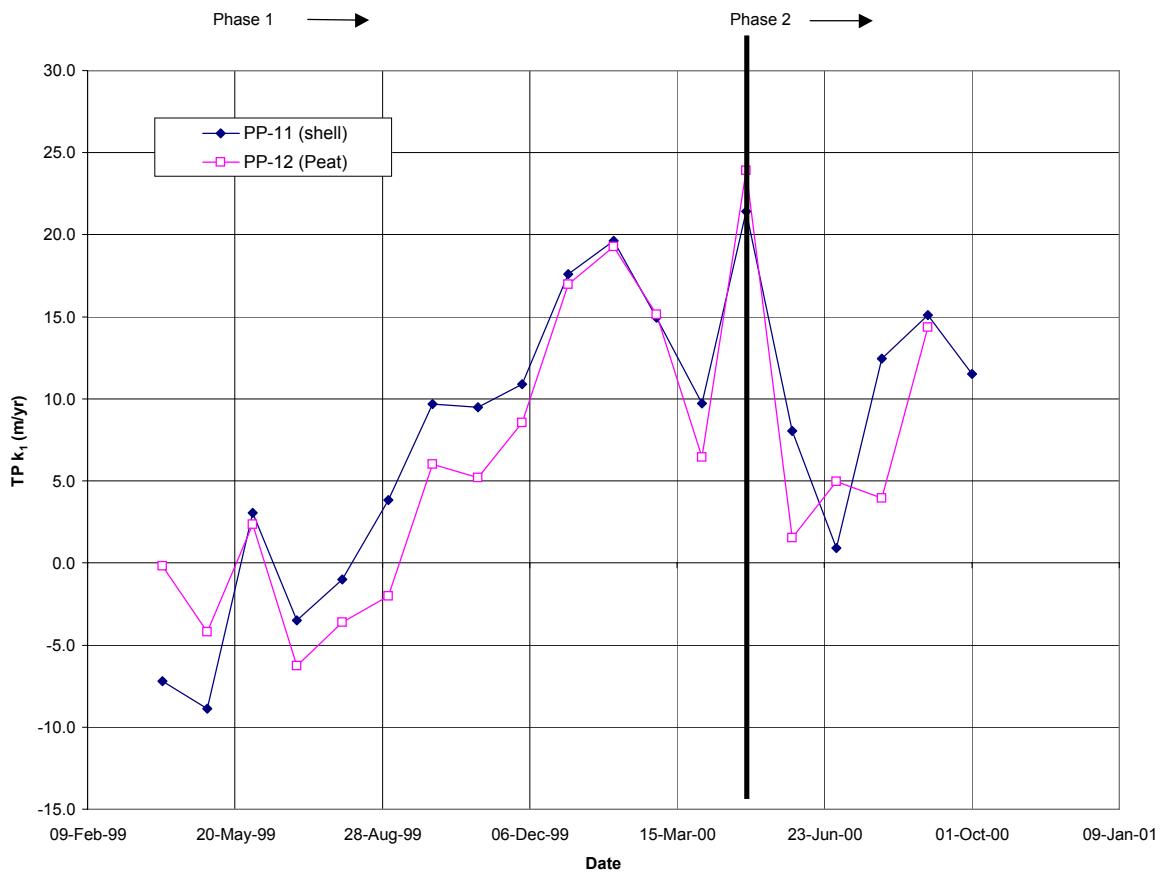
#### EXHIBIT 2-2

Porta-PSTA  $k_{1\text{TP}}$  Values in Treatments PP-3 (Peat) and PP-4 (Shellrock) for the Period-of-Record



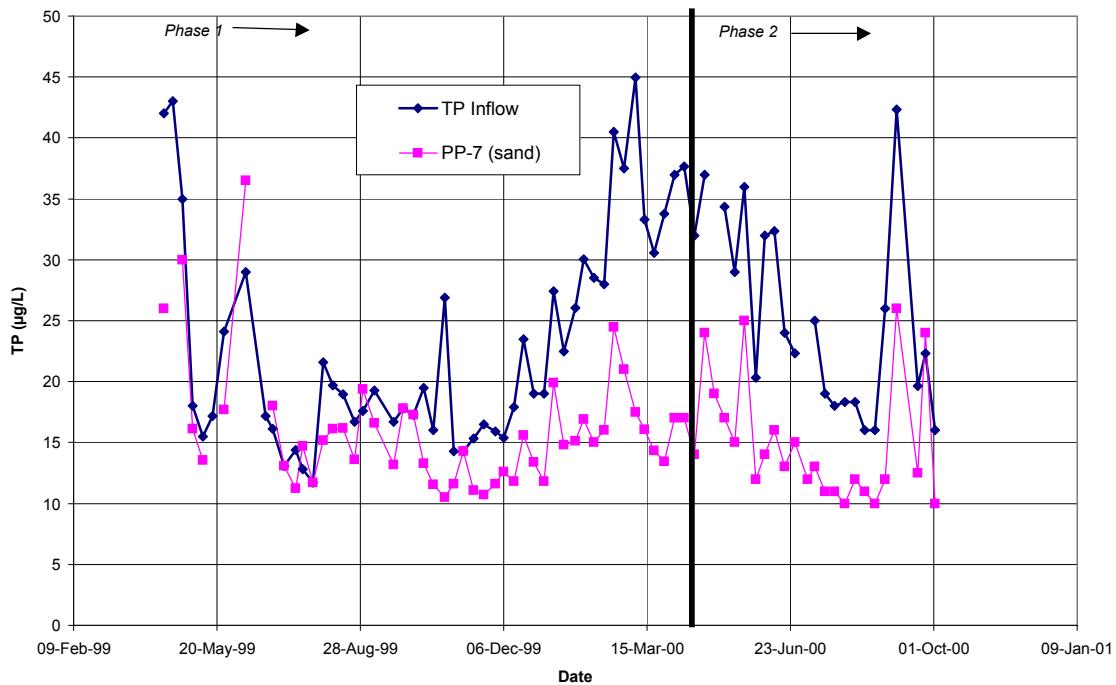
#### EXHIBIT 2-3

Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-11 (3x6 m Shellrock) and PP-12 (3x6 m Peat) for the Period-of-Record

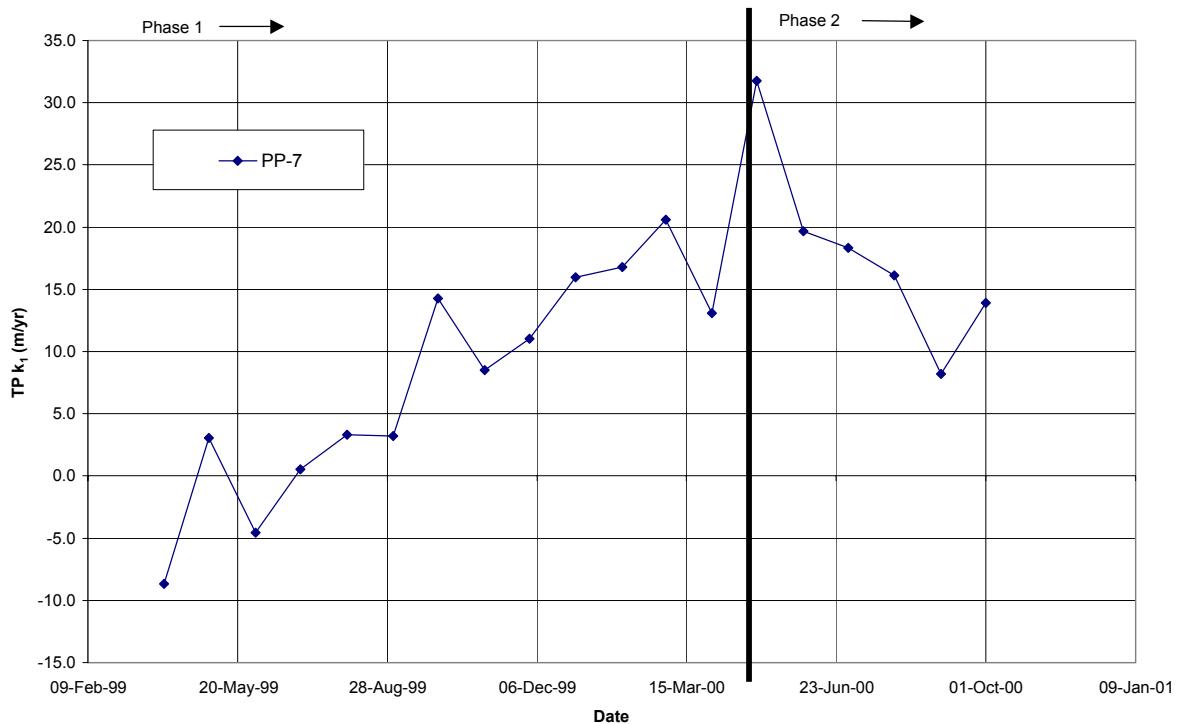


#### EXHIBIT 2-4

Porta-PSTA  $k_{\text{TP}}$  Values in Treatments PP-11 (3x6 m Shellrock) and PP-12 (3x6 m Peat) for the Period-of-Record



**EXHIBIT 2-5**  
Porta-PSTA TP Inflow and Outflow Concentrations in Treatment PP-7 (1x6 m Sand) for the Period-of-Record



**EXHIBIT 2-6**  
Porta-PSTA  $k_{1\text{TP}}$  Values in Treatment PP-7 (Sand) for the Period-of-Record

Exhibit 2-8 includes the  $k_{1TP}$  time series data for PSTA Test Cell treatments STC-1/STC-4 and STC-2/STC-5. TP removal rate constants have been consistently higher in the shellrock treatment than in the peat-based system during Phase 2. The Phase 2 average  $k_{1TP}$  values for STC-4 and STC-5 were -7.1 and 11.9 m/y, respectively.

The third Test Cell PSTA (STC-3) was renamed STC-6 for Phase 2; the Phase 1 variable depth condition was changed to full dry-out mode in Phase 2. Exhibit 2-9 provides the TP time series for PSTA Test Cell treatments STC-3 and STC-6 (shellrock with variable water regime). This cell was in a dryout mode (no inflow with outlet weir lowered) from March 6 to May 18, 2000. Phase 2 average inflow TP concentration was approximately 26 µg/L, and outflow TP concentration for this treatment was 14 µg/L. There was no apparent detrimental effect of dryout on outflow TP concentration. System treatment performance recovered to pre-drydown conditions within approximately 2 weeks of rehydration. Exhibit 2-10 illustrates the trend in  $k_{1TP}$  in the dry-down PSTA Test Cell treatment. The value for  $k_{1TP}$  increased quickly following re-flooding and remained relatively high until the end of the Phase 2 period. The Phase 2 average  $k_{1TP}$  for this cell was 13.8 m/y, but averaged more than 25 m/y for the last 4 months of Phase 2.

## **2.2.3 Other Phase 2 Treatments**

### **2.2.3.1 Limerock vs. Shellrock**

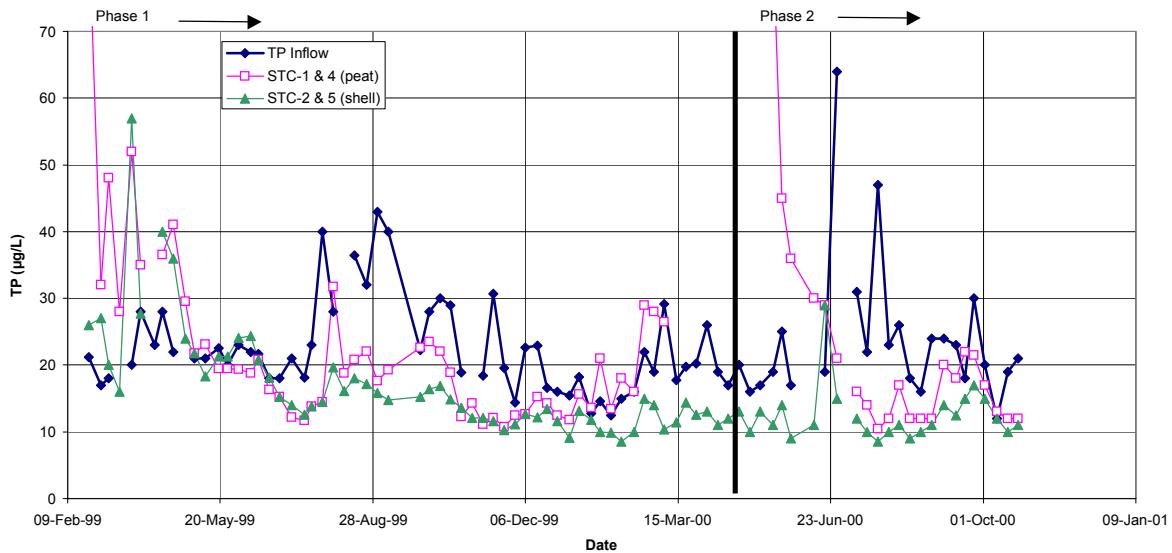
Exhibit 2-11 illustrates the Phase 2 TP trends for Porta-PSTA treatments PP-4 (shellrock) and PP-14 (limerock). Average outflow TP concentrations were essentially the same for these two replicated treatments, at 15 µg/L for PP-4 and 16 µg/L for PP-14. Exhibit 2-12 illustrates the time series of average  $k_{1TP}$  values for these two treatments. Average Phase 2  $k_{1TP}$  values were essentially the same at 20.8 m/y and 19.4 m/y for PP-4 and PP-14, respectively.

### **2.2.3.2 Sand with HCl Rinse**

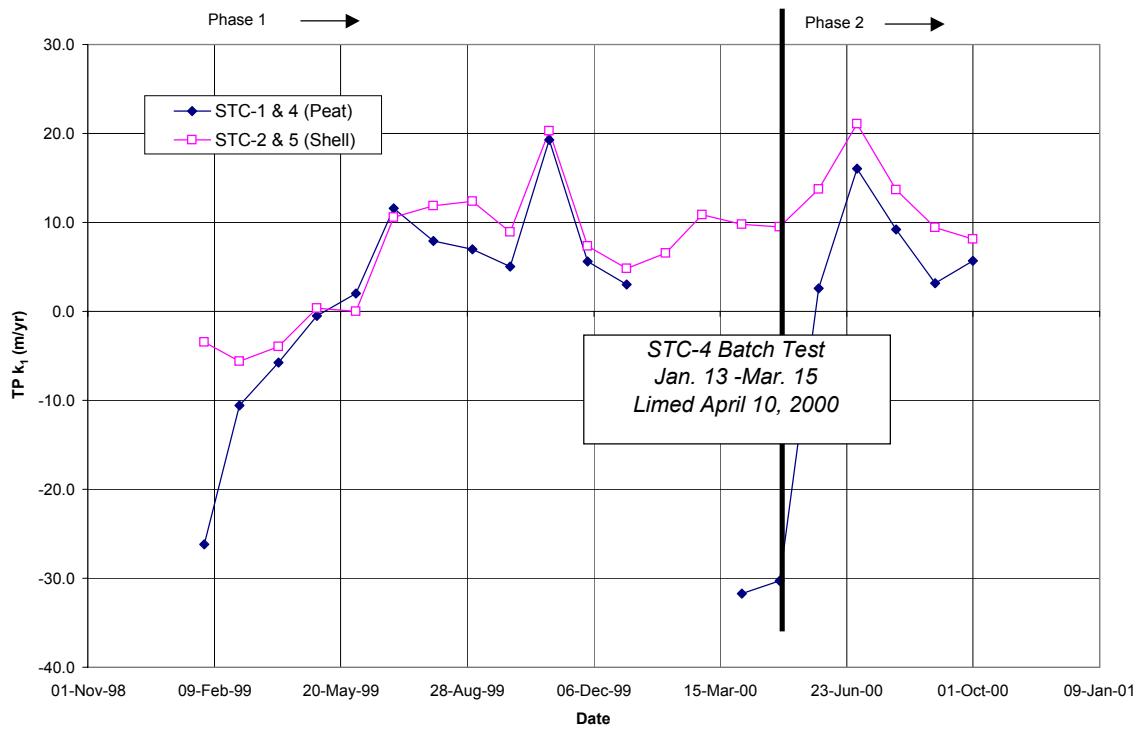
Exhibit 2-13 compares TP time series data for unreplicated Porta-PSTA treatments PP-7 (sand) and PP-17 (sand with HCl rinse). Average TP outflow concentrations were essentially the same, with the HCl rinse at 14 µg/L at PP-7 compared to 15 µg/L at PP-17. Exhibit 2-14 illustrates the time series of average  $k_{1TP}$  values for these two treatments. Average Phase 2  $k_{1TP}$  values were essentially the same at 20.3 m/y and 21.8 m/y for PP-7 and PP-17, respectively.

### **2.2.3.3 Non-Soil Control and Aquamat**

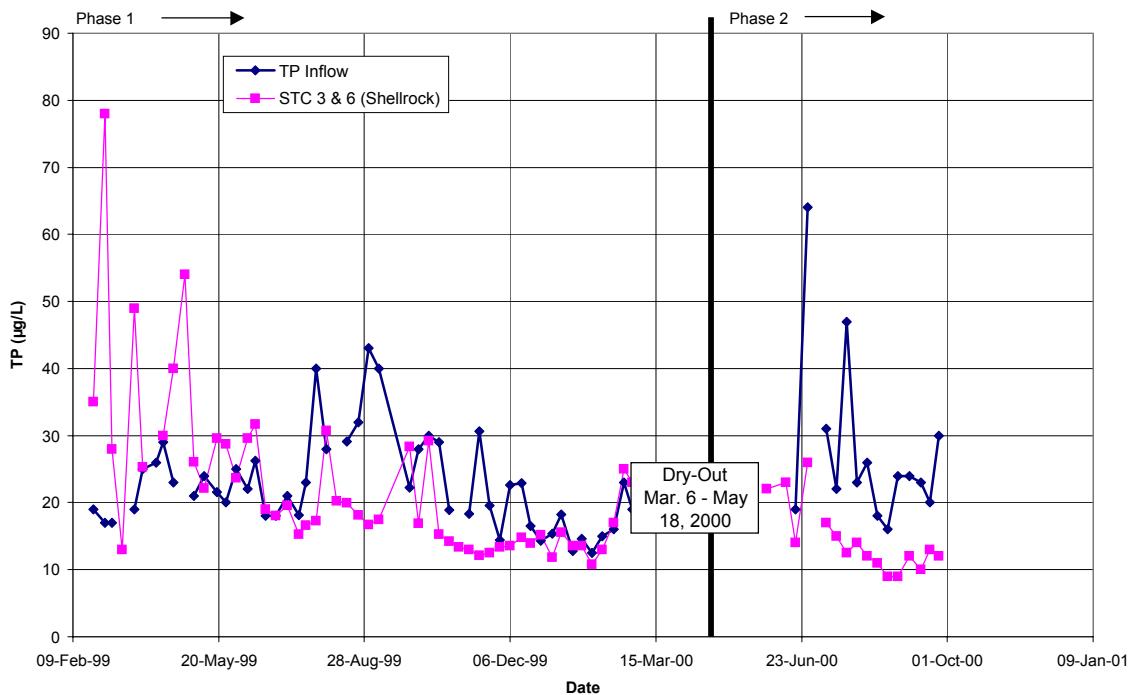
Exhibit 2-15 provides a comparison of the two Porta-PSTA treatments that did not have soils. Treatment PP-18 had no substrate while PP-19 had Aquamat, a synthetic algal growth substrate used in fish ponds. Average TP outflow concentration in the Aquamat treatment was slightly lower, at 15 µg/L in PP-19 compared to 17 µg/L in PP-18. Exhibit 2-16 compares the  $k_{1TP}$  values for treatments PP-18 and PP-19. Average removal rate constants were 17.9 m/y and 19 m/y, respectively.



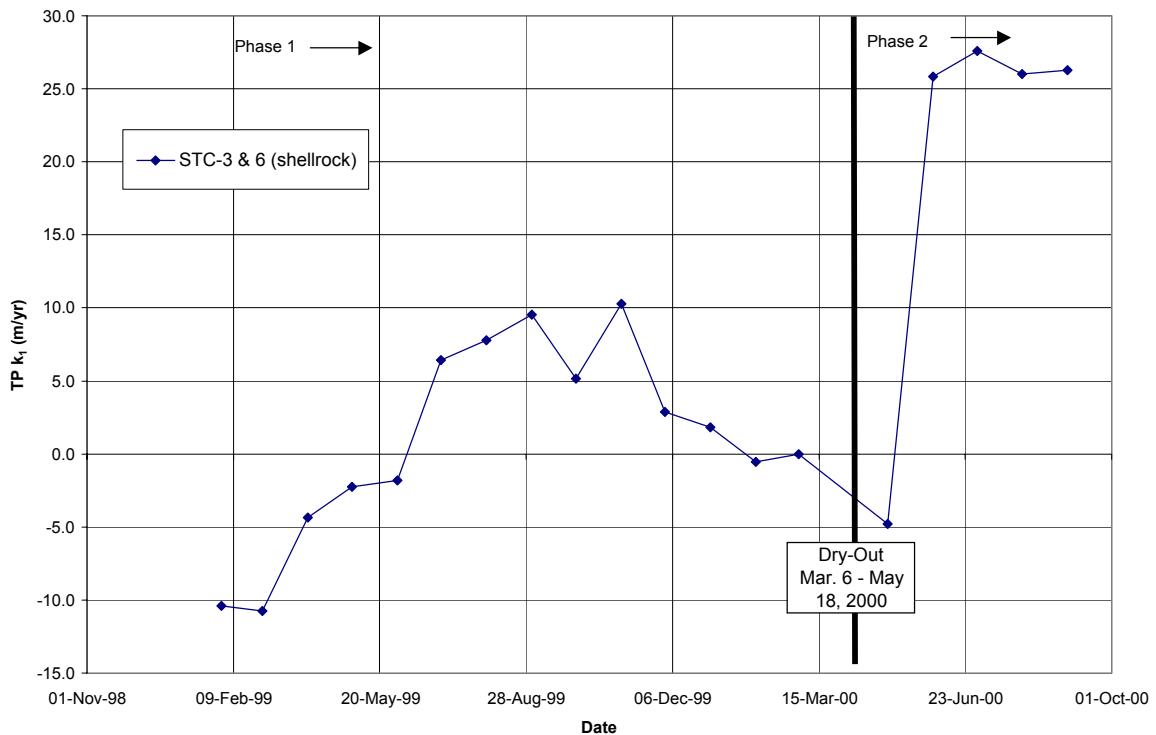
**EXHIBIT 2-7**  
PSTA Test Cell TP Inflow and Outflow Concentrations in Treatments STC-1/4 (Peat) and STC-2/5 (Shellrock) for the Period-of-Record



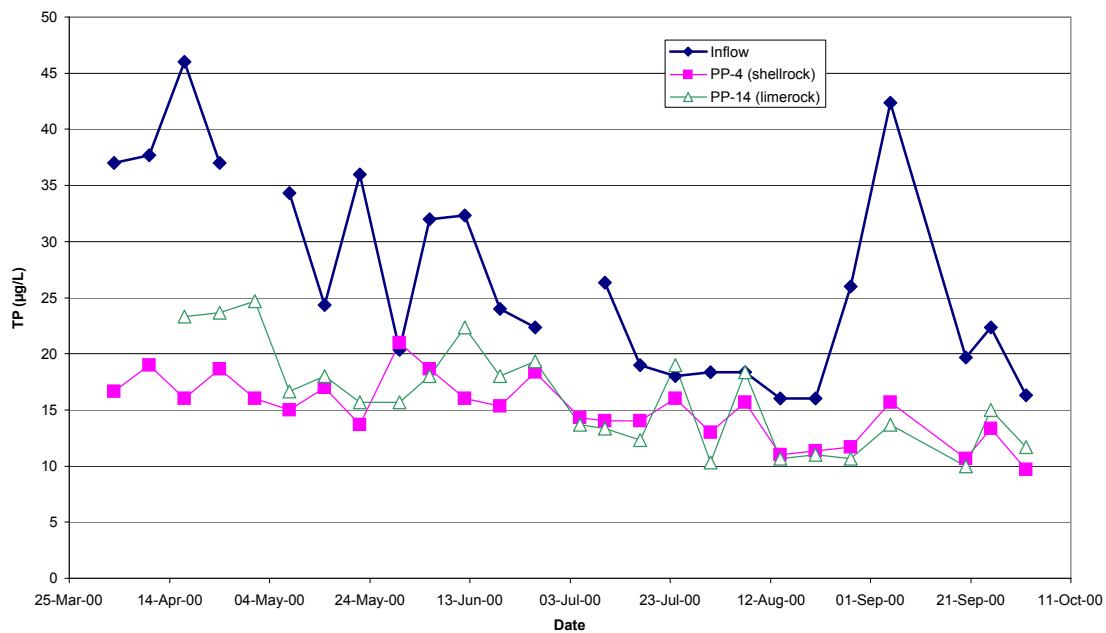
**EXHIBIT 2-8**  
PSTA Test Cell  $k_{TP}$  Values in Treatments STC-1/4 (Peat) and STC-2/5 (Shellrock) for the Period-of-Record



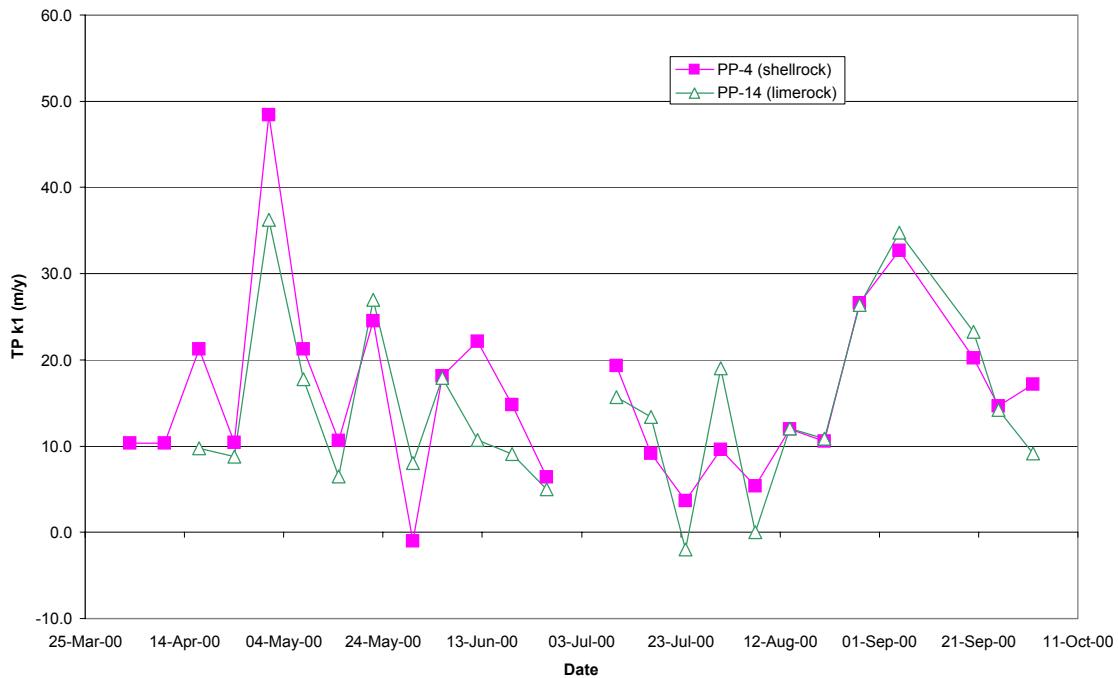
**EXHIBIT 2-9**  
PSTA Test Cell TP Concentration Trends in STC-3/6 (Shellrock with Dry-down) for the Period-of-Record



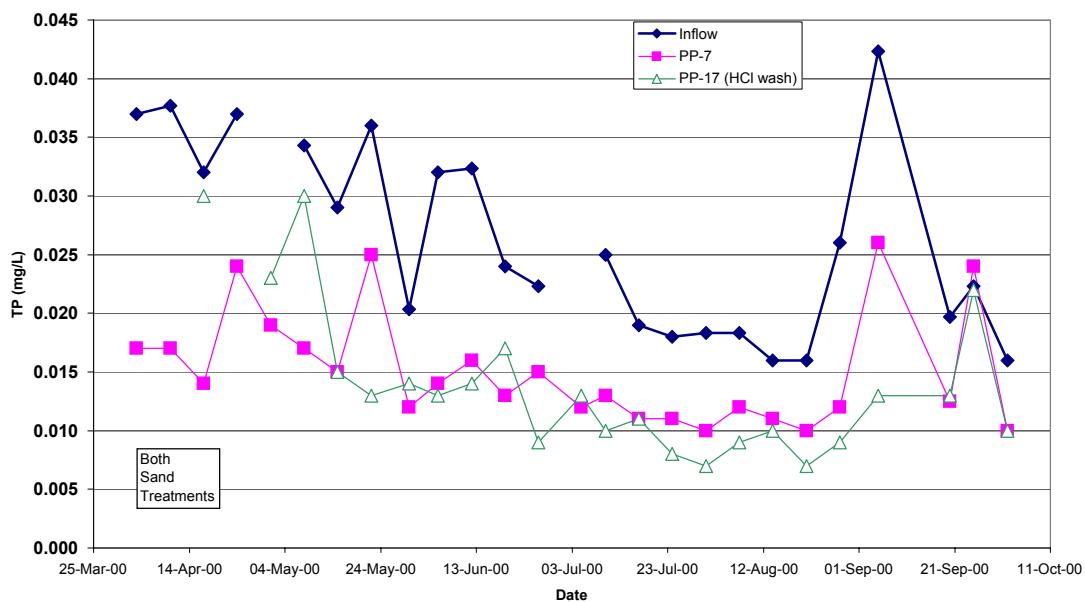
**EXHIBIT 2-10**  
PSTA Test Cell  $k_{1\text{TP}}$  Values in Treatment STC-3/6 (Shellrock with Dry-out) for the Period-of-Record



**EXHIBIT 2-11**  
Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-4 (1x6 m Shellrock) and PP-14 (1x6 m Limerock) for Phase 2

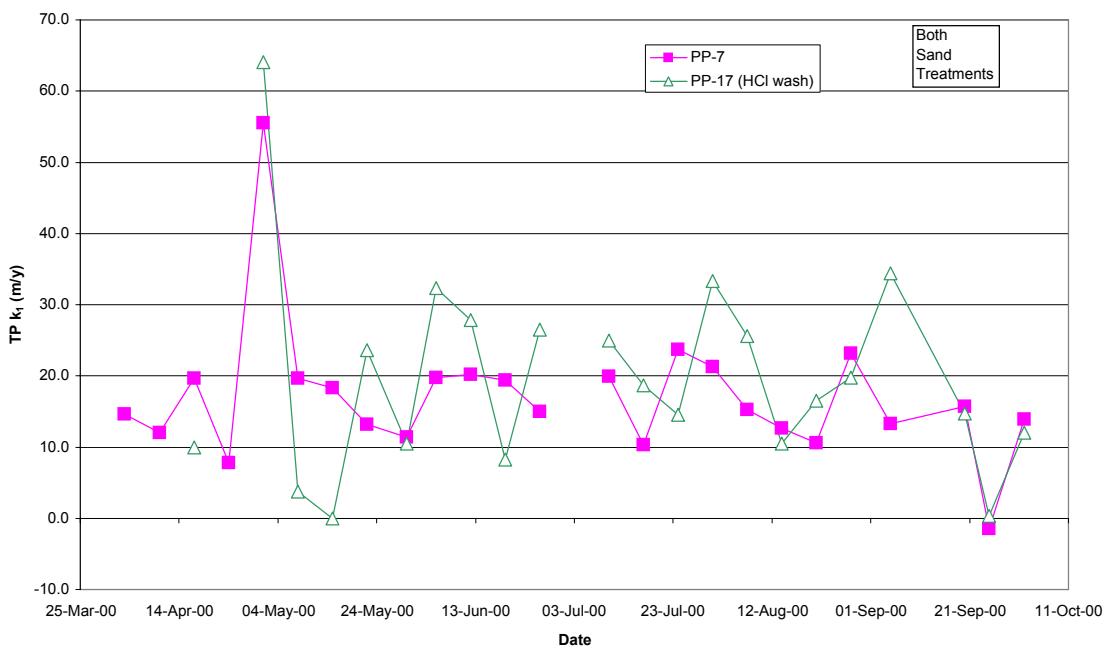


**EXHIBIT 2-12**  
Porta-PSTA  $k_{TP}$  Values in Treatments PP-4 (Shellrock) and PP-14 (Limerock) for Phase 2



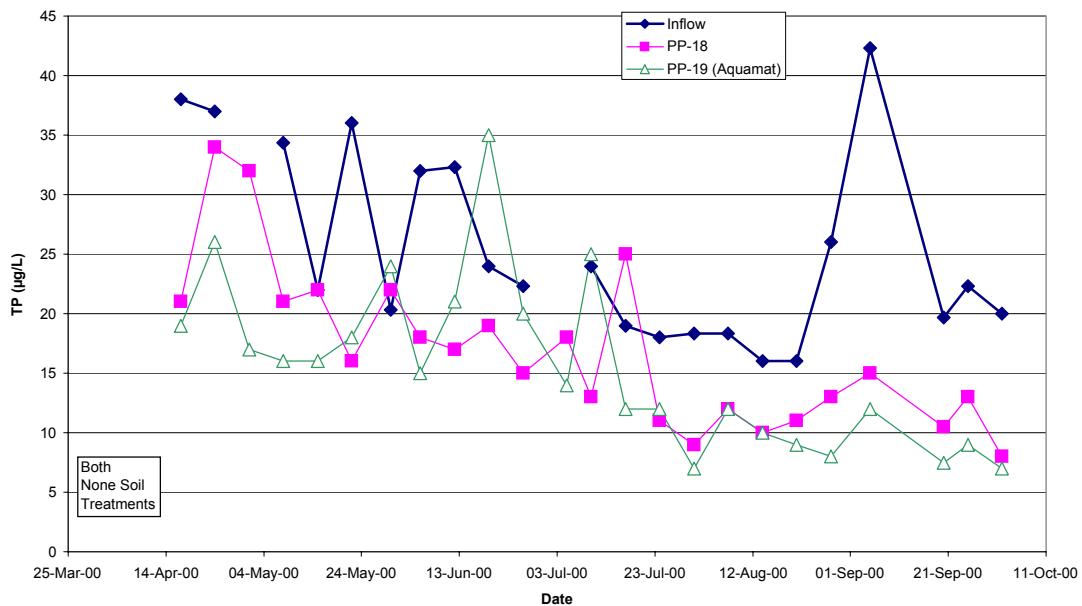
**EXHIBIT 2-13**

Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-7 (Sand) and PP-17 (Sand Rinsed with HCl) for Phase 2

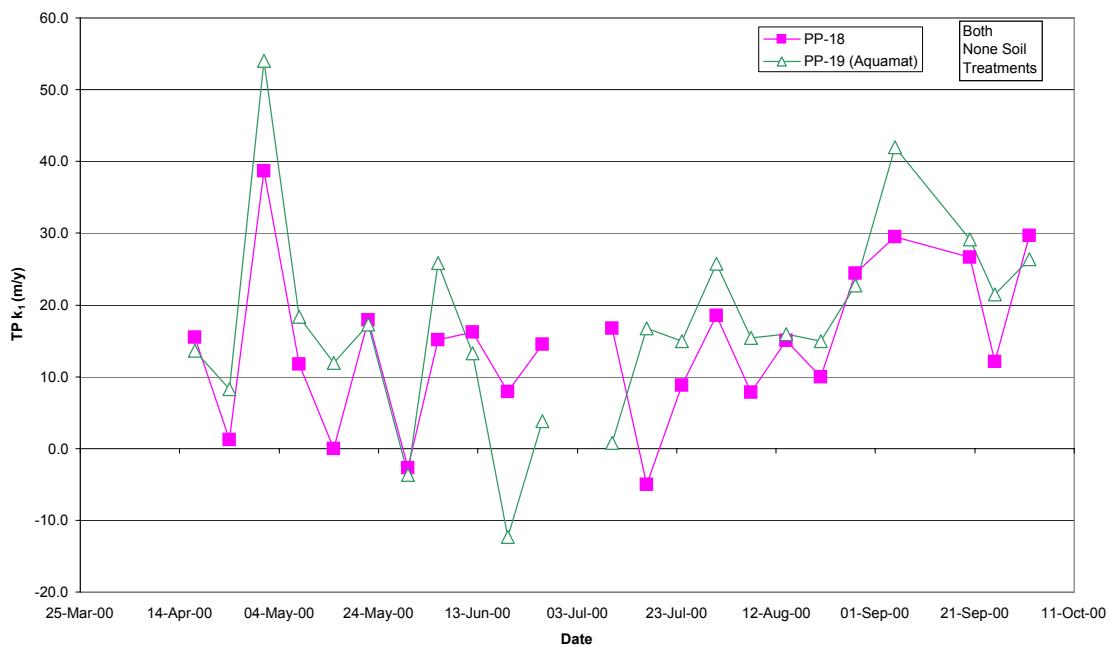


**EXHIBIT 2-14**

Porta-PSTA  $k_{1TP}$  Values in Treatments PP-7 (Sand) and PP-17 (Sand Rinsed with HCl) for Phase 2



**EXHIBIT 2-15**  
Porta-PSTA TP Inflow and Outflow Concentrations in Treatments PP-18 (No Substrate) and PP-19 (Aquamat) for Phase 2



**EXHIBIT 2-16**  
Porta-PSTA  $k_{1TP}$  Values in Treatments PP-18 (No Substrate) and PP-19 (Aquamat) for Phase 2

#### **2.2.3.4 Higher Velocity**

Exhibit 2-17 compares the TP time series data for PP-4 and PP-15. Both treatments had shellrock soils and were operated at the 30-cm water depth. Treatment PP-15 had re-circulation pumps installed to provide approximately 20 gpm of pumping from the downstream end of the tank back to the inflow baffle. This re-circulation pumping resulted in a velocity increase with no increase in influent TP loading. The nominal velocity in PP-4 was 0.0014 centimeters per second (cm/s); in PP-15, nominal velocity was approximately 0.5 cm/s. Actual velocities were typically less than this nominal value because of lower pumping rates in some of the replicate mesocosms.

There was an initial increase in average TP outflow concentration observed in PP-15 as a result of running the re-circulation pumps. This resulted in a higher Phase 2 average of 18 µg/L in the re-circulation treatment, compared to 15 µg/L in PP-4. However, the time-series data in Exhibit 2-17 indicate that there was no detectable difference in performance between the two treatments during the last 4 months of the test. Exhibit 2-18 illustrates the time series for  $k_{ITP}$  values for these two treatments. Phase 2 averages for PP-4 and PP-15 were 20.8 and 14.4 m/y, respectively.

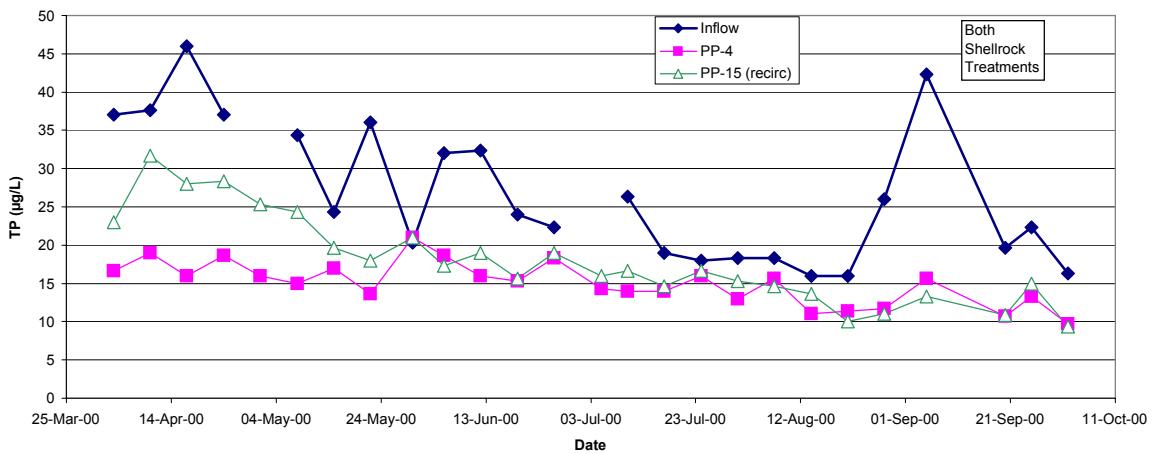
#### **2.2.3.5 PSTA Dry-Out**

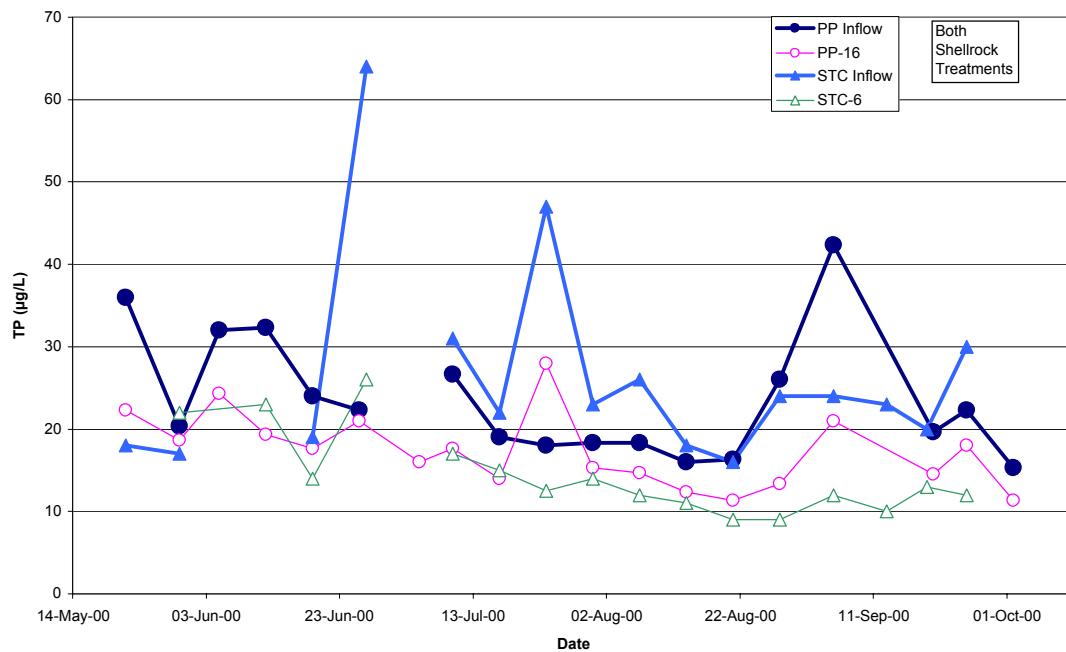
Exhibit 2-19 illustrates the TP time series data for PSTA treatments PP-16 and STC-6. Both treatments received no appreciable water inputs from March 6 until May 18, 2000. Outflow TP concentrations for both treatments declined during the 6-month Phase 2 period following dry-out. The PSTA Test Cell treatment performed slightly better than the Porta-PSTA dry-out treatment. Treatment averages for TP outflow concentration during Phase 2 were 17 µg/L and 14 µg/L for PP-6 and STC-6, respectively. This difference was even greater during the last 4 months of data collection during Phase 2. STC-6 achieved a lower average TP outflow concentration (12 µg/L) compared to PP-16 (16 µg/L) during this period.

Exhibit 2-20 provides a summary of the  $k_{ITP}$  values for these two dry-out treatments. Although the Test Cell treatment achieved a lower TP outflow concentration,  $k_{ITP}$  was higher in PP-16 than in STC-6, with Phase 2 average values of 21.6 and 13.8, respectively. This apparent relationship, however, was reversed during the last 4 months of data collection when STC-6 achieved a higher average  $k_{ITP}$  value (24.8 µg/L) compared to PP-16 (19.7 µg/L).

### **2.3 Efficacy of Calcium Amendment of Peat Soils**

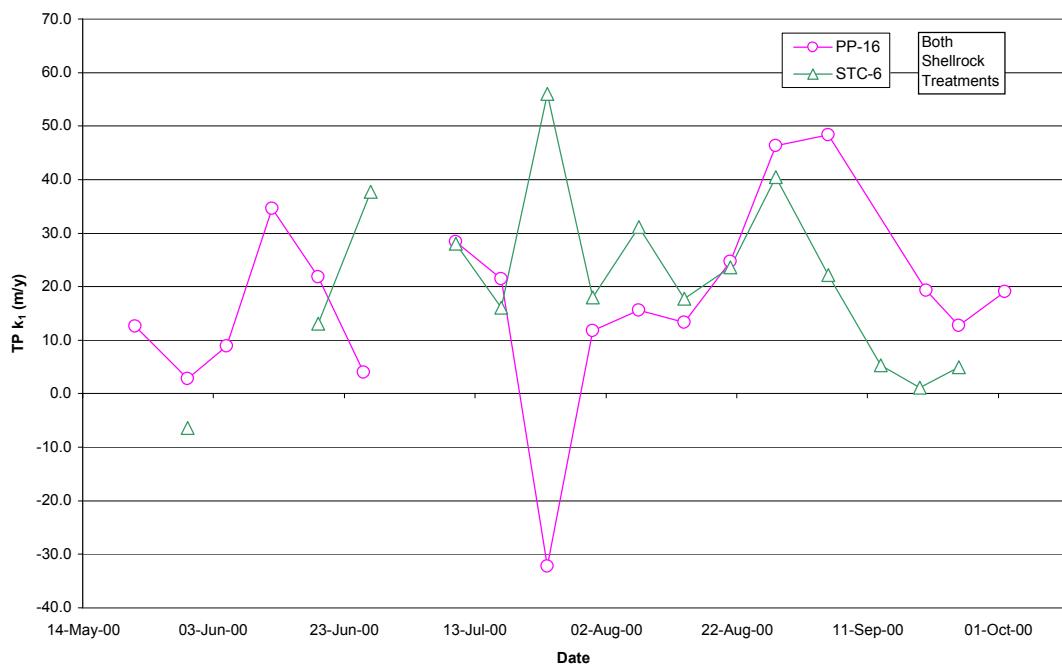
It was observed during Phase 1 that peat soils released labile P to the water column at a higher rate and for a longer period than the calcium-based shellrock soils (CH2M HILL, August 2000). Chemical soil amendments have been suggested as one method to overcome this start-up phenomenon when organic farm soils with labile P are initially flooded for STA construction (Ann et al., 2000). Ann et al. (2000) reported that 6.7 metric tonnes per hectare (mt/ha) of hydrated lime fully immobilized soluble reactive P from peat soils with a TP of approximately 620 milligrams per kilogram (mg/kg) and a labile P fraction of approximately 22 mg/kg. For comparison purposes, the PSTA soils had from approximately 200 to 300 mg/kg of TP and from 4 to 9 mg/kg of labile P.





#### EXHIBIT 2-19

TP Inflow and Outflow Concentrations in Test Cell Treatment STC-6 (Shellrock with Dry-out) and Porta-PSTA Treatment PP-16 (Shellrock with Dry-out) for Phase 2



#### EXHIBIT 2-20

PSTA  $k_{1TP}$  in Test Cell Treatment STC-6 (Shellrock with Dry-out) and Porta-PSTA Treatment PP-16 (Shellrock with Dry-out) for Phase 2

Phase 2 PSTA research in these mesocosms was expanded to look at the effects of amending some of the peat (organic) soils with calcium minerals recommended by Ann et al. (2000). This section provides a preliminary evaluation of the data from these amended soil PSTA mesocosms.

Soil amendments were made in two Phase 2 PSTA treatments:

- PSTA South Test Cell Treatment 1 (STC-1 or Test Cell 13) was converted to South Test Cell Treatment 4 (STC-4) by the addition of approximately 1,580 kg of hydrated lime [ $\text{Ca}(\text{OH})_2$ ], providing an effective application rate of 7 mt/ha.
- Porta-PSTA Treatment 1 (PP-1 or Cells 9, 11, and 18) were converted to Porta-PSTA Treatment 13 (PP-13) by the addition of 4.1 kg of hydrated lime each, providing an effective application rate of 6.8 mt/ha.

The process followed in these lime applications is described as follows. After removal of all vegetation from these mesocosms, the cells were partially drained and the lime was applied by hand over the surface of the soils. It was not mixed into the soils to any great extent. Following lime addition, these mesocosms were re-flooded, re-planted, and monitoring of inflow and outflow water quality was resumed. While the Phase 1 water depth in each of these mesocosms had been 60 cm, the Phase 2 water depth was lowered to approximately 30 cm. The purpose of this depth change was to document the effects of consistently lower water depth on PSTA performance and periphyton growth. This change was recommended by the SRP during the Phase 1 data review.

There was no control available to look at the effect of the water depth change alone. Concurrent data from Porta-PSTA Treatment 3 (PP-3), which has peat soils at 30-cm water depth, provides a comparison for differences from the Phase 1 vs. Phase 2 operational time periods.

Data analysis from these treatments includes comparisons between STC-1 and STC-4 and Porta-PSTA Treatment PP-1 and PP-13 averages before and after liming for a 180-day period during each research phase. In addition, Porta-PSTA Treatment PP-3 data were also analyzed for these same periods. Three analyses were made:

- TP monthly average outflow concentrations were evaluated for the 6 months following flooding
- Cumulative average monthly TP removal was estimated for the 6 months following flooding
- Estimates of monthly average  $k_{\text{TP}}$  values were made for each treatment for 6 months following flooding

In addition to the above analyses, these same three parameters were calculated for the last 60 days of each 6-month period. Exhibit 2-21 provides a tabular summary of these data analyses. Exhibits 2-22 through 2-27 provide graphical summaries. Data from the Test Cells and the Porta-PSTAs are described separately and then discussed together.

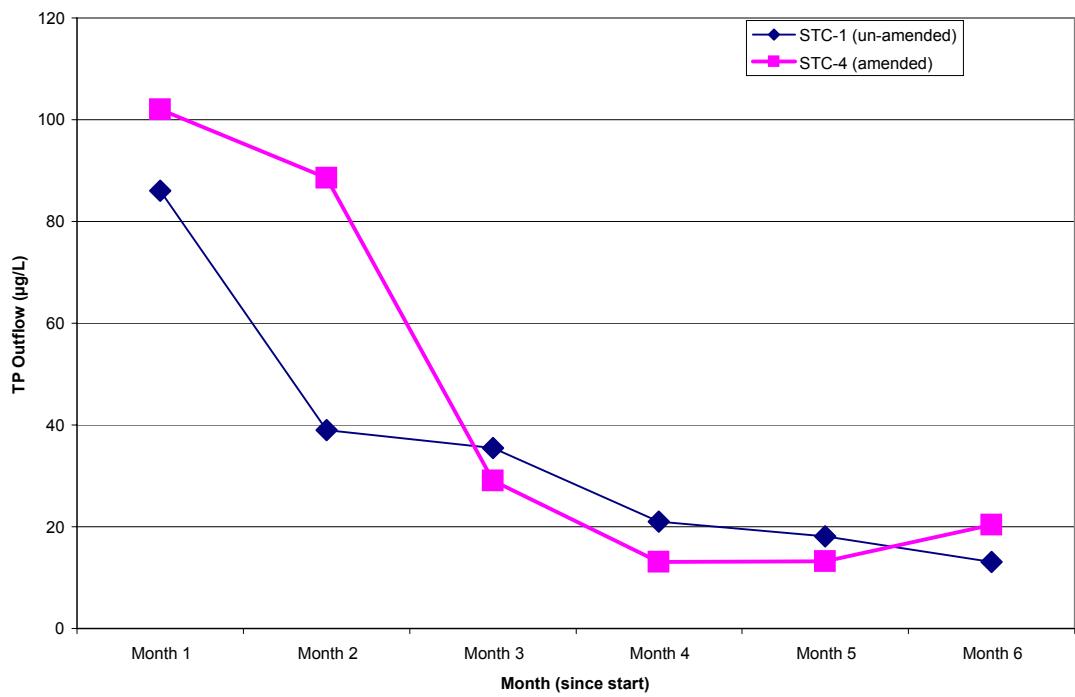
### 2.3.1 Test Cells

Average water depth in the peat-based PSTA cell (STC-1/STC-4) changed from 62 cm during Phase 1 to 26 cm in Phase 2. Average inflow TP concentrations to the Test Cells

## EXHIBIT 2-21

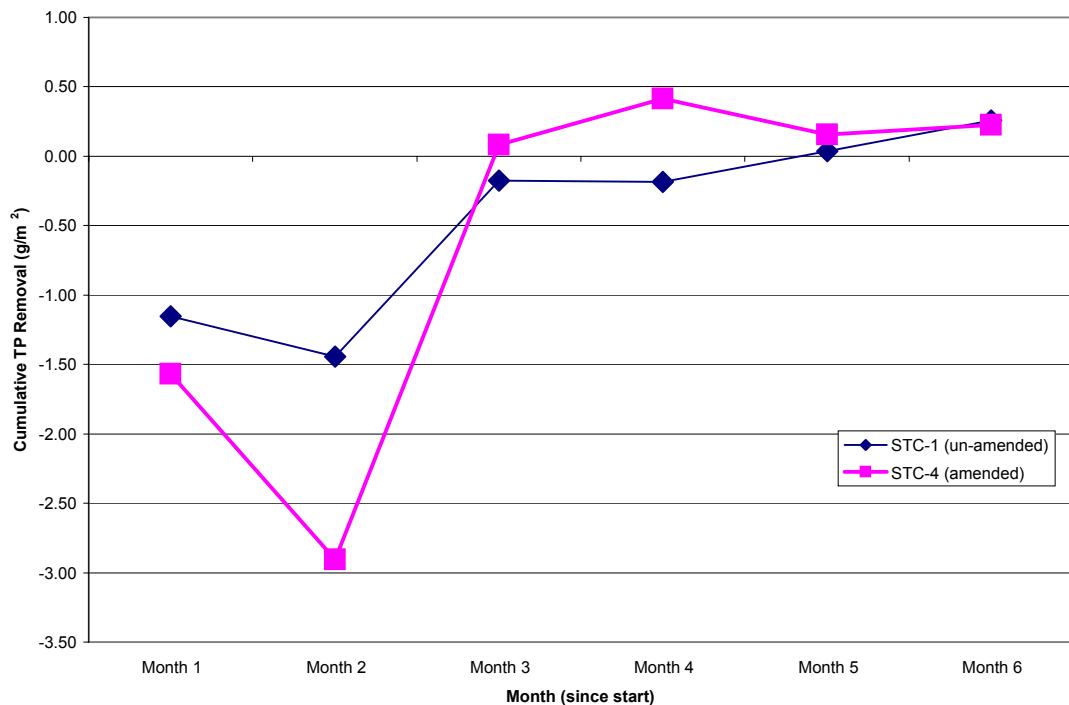
SFWMD PSTA Research and Demonstration Project Amended Peat Soils Data Summary

Treatment	Period	q_in (cm/d)	Wtr Depth (m)	TP (mg/L)		TP (g/m <sup>2</sup> )		Removal (g/m <sup>2</sup> )		Calc_k (m/y)
				Inflow	Outflow	Inflow	Outflow	Average	Cumulative (%)	
STC-1	POR (180d)	4.6	0.62	22	35	0.37	0.60	-0.23	---	-62.1 -8.3
	Last 60 d	4.7	0.64	23	16	0.39	0.27	0.13	---	32.4 6.7
	Month 1	4.7	0.51	19	86	0.32	1.47	-1.15	-1.15	-364.9 -26.2
	Month 2	4.3	0.65	20	39	0.33	0.62	-0.29	-1.44	-88.4 -10.6
	Month 3	4.7	0.66	25	36	0.43	0.60	-0.17	-0.17	-40.7 -5.8
	Month 4	4.7	0.63	20	21	0.35	0.36	-0.01	-0.18	-3.0 -0.5
	Month 5	4.7	0.63	20	18	0.35	0.31	0.04	0.04	11.1 2.0
STC-4	POR (180d)	5.1	0.26	24	44	0.46	0.84	-0.38	---	-82.3 -11.2
	Last 60 d	5.2	0.31	23	17	0.43	0.32	0.11	---	26.2 5.8
	Month 1	5.2	0.15	19	102	0.36	1.93	-1.57	-1.57	-436.8 -31.7
	Month 2	5.1	0.25	18	89	0.33	1.67	-1.34	-2.90	-404.9 -30.3
	Month 3	5.1	0.28	33	29	0.62	0.54	0.08	0.08	13.0 2.6
	Month 4	5.1	0.28	31	13	0.58	0.24	0.33	0.41	57.7 16.0
	Month 5	5.1	0.29	22	13	0.40	0.25	0.16	0.16	39.1 9.2
PP-1	POR (180d)	5.6	0.65	21	21	0.42	0.42	0.01	---	1.2 0.3
	Last 60 d	7.0	0.67	18	20	0.46	0.48	-0.02	---	-5.2 -1.7
	Month 1	5.0	0.59	38	38	0.71	0.68	0.03	0.03	4.7 0.2
	Month 2	4.6	0.67	18	16	0.30	0.27	0.03	0.06	10.0 2.1
	Month 3	5.0	0.67	21	15	0.36	0.28	0.08	0.08	23.2 5.5
	Month 4	5.4	0.66	13	17	0.25	0.32	-0.07	0.02	-27.5 -5.1
	Month 5	5.9	0.66	20	22	0.41	0.47	-0.06	-0.06	-13.5 -2.8
PP-13	POR (180d)	7.9	0.33	32	19	0.90	0.54	0.36	---	40.1 14.3
	Last 60 d	8.7	0.35	24	13	0.76	0.40	0.35	---	46.6 19.3
	Month 1	5.7	0.28	42	23	0.87	0.47	0.40	0.40	46.1 12.2
	Month 2	7.3	0.34	54	28	1.55	0.72	0.83	1.23	53.3 17.6
	Month 3	8.5	0.34	28	21	0.84	0.65	0.18	0.18	21.8 8.5
	Month 4	8.6	0.34	20	18	0.61	0.56	0.05	0.23	7.5 2.9
	Month 5	8.6	0.36	20	12	0.61	0.37	0.24	0.24	39.6 15.2
PP-3 (period 1)	POR (180d)	5.5	0.32	21	20	0.41	0.39	0.02	---	5.7 1.4
	Last 60 d	6.8	0.32	18	19	0.44	0.46	-0.02	---	-4.8 -1.2
	Month 1	4.7	0.32	38	30	0.67	0.52	0.15	0.15	23.0 4.1
	Month 2	4.6	0.32	18	18	0.31	0.30	0.01	0.16	3.0 0.4
	Month 3	4.9	0.32	21	18	0.37	0.33	0.05	0.05	12.8 3.1
	Month 4	5.2	0.32	13	14	0.24	0.27	-0.03	0.02	-11.6 -1.9
	Month 5	5.8	0.31	19	20	0.39	0.41	-0.01	-0.01	-3.3 -0.9
PP-3 (period 2)	POR (180d)	7.6	0.30	31	19	0.81	0.51	0.30	---	37.2 14.0
	Last 60 d	7.9	0.30	24	19	0.68	0.52	0.16	---	23.5 6.9
	Month 1	5.3	0.30	38	20	0.74	0.39	0.35	0.35	47.3 12.7
	Month 2	7.0	0.30	53	19	1.24	0.47	0.77	1.12	62.4 26.9
	Month 3	9.0	0.30	28	20	0.90	0.64	0.25	0.25	28.3 11.3
	Month 4	8.4	0.30	21	18	0.63	0.52	0.11	0.36	17.6 4.7
	Month 5	8.2	0.30	19	17	0.56	0.48	0.08	0.08	13.9 3.0
	Month 6	7.7	0.30	28	20	0.80	0.55	0.24	0.32	30.3 9.6



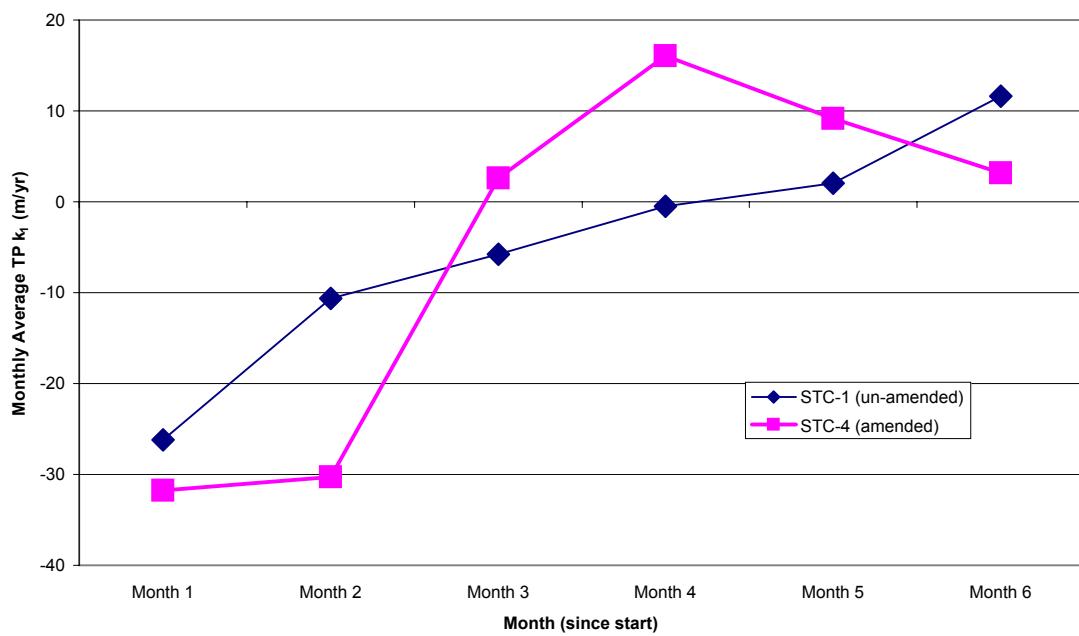
#### EXHIBIT 2-22

Average Monthly TP Outflow Concentrations in the PSTA Test Cells Peat Soil Treatments with and without Lime Amendments



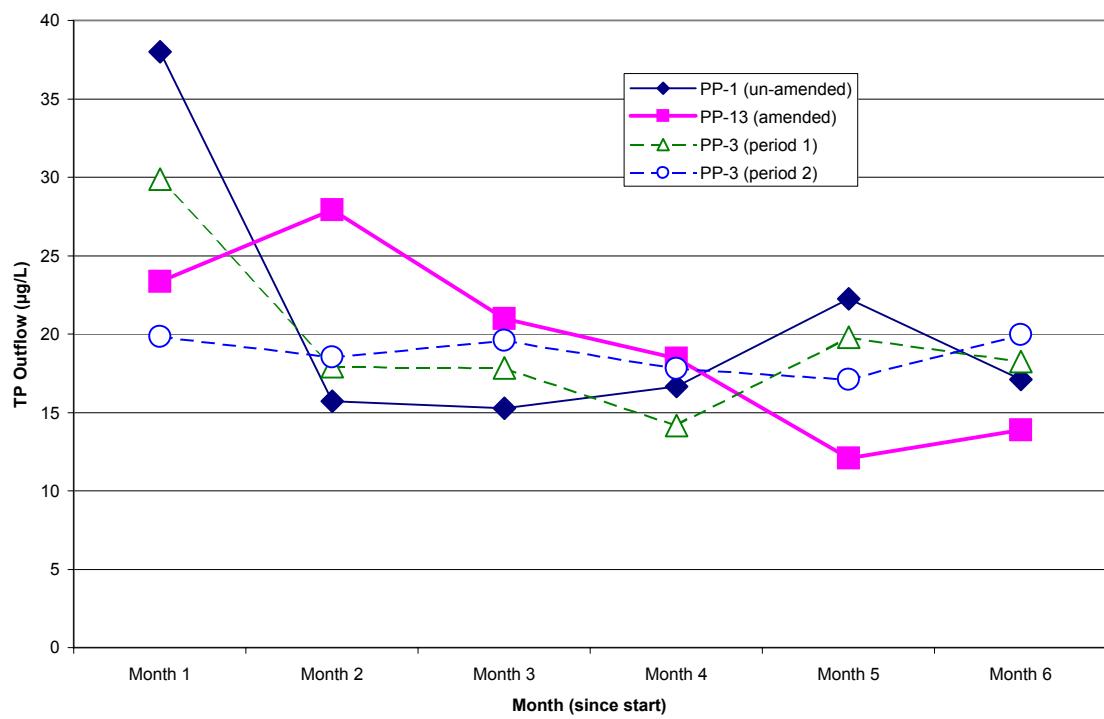
#### EXHIBIT 2-23

Cumulative TP Mass Removed in the PSTA Test Cells Peat Soil Treatments with and without Lime Amendments



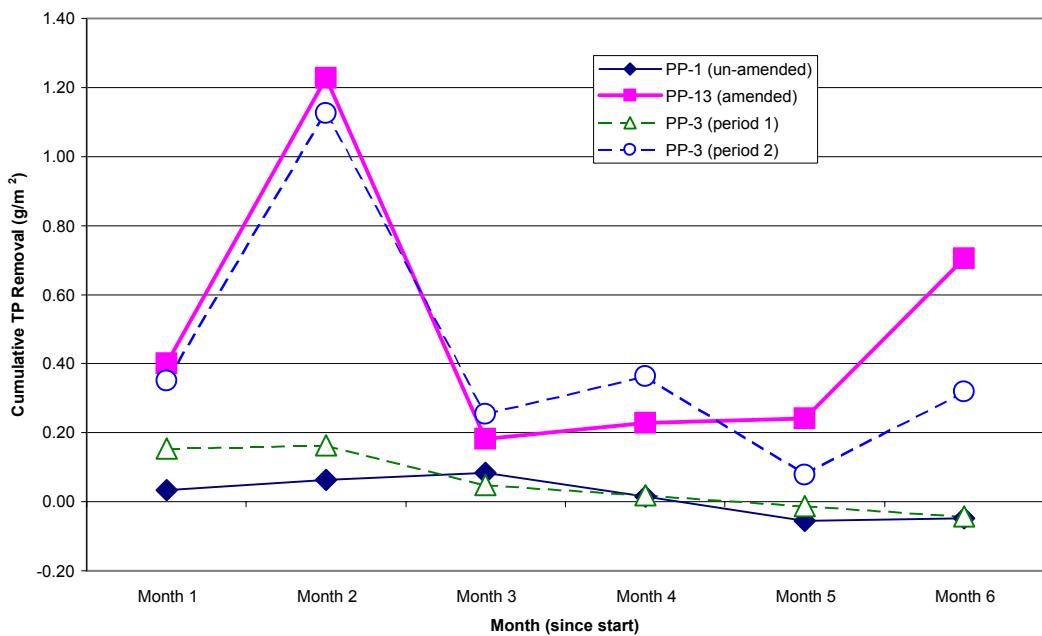
#### EXHIBIT 2-24

Average Monthly  $k_{1\text{TP}}$  in the PSTA Test Cells Peat Soil Treatments with and without Lime Amendments

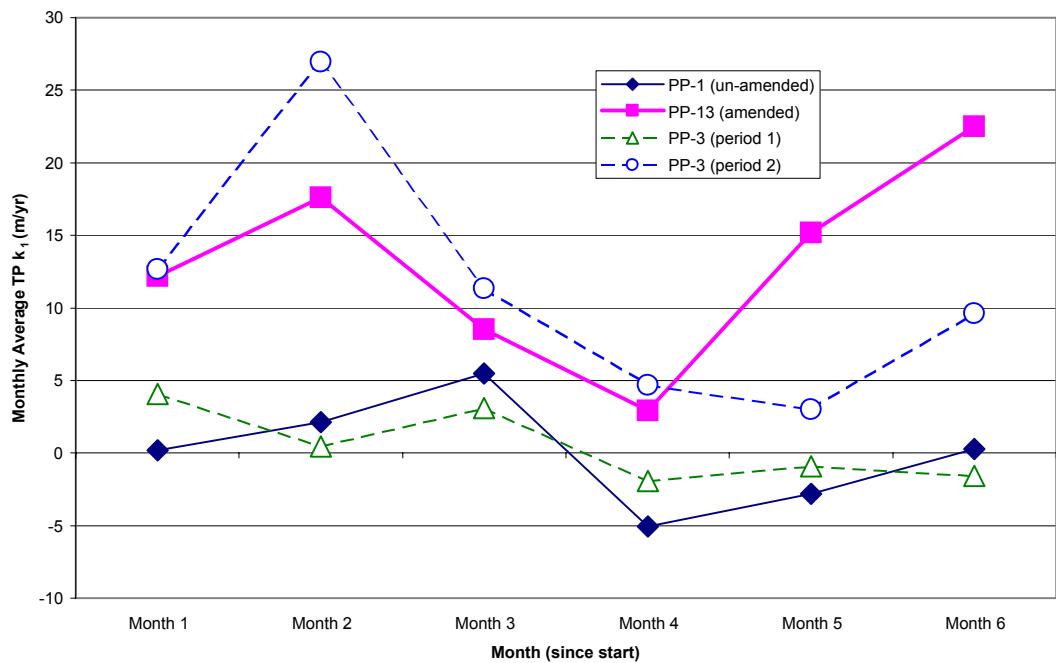


#### EXHIBIT 2-25

Average Monthly TP Outflow Concentrations in the Porta-PSTA Peat Soil Treatments with and without Lime Amendments



**EXHIBIT 2-26**  
Cumulative TP Mass Removed in the Porta-PSTA Peat Soil Treatments with and without Lime Amendments



**EXHIBIT 2-27**  
Average Monthly  $k_{1\text{TP}}$  in the Porta-PSTA Peat Soil Treatments with and without Lime Amendments

during each 180-day period were similar at 22 and 24 µg/L, but average loads were higher in STC-4 (amended) because of a slightly higher hydraulic loading rate (HLR). Average 6-month TP outflow concentration was higher in STC-4 (amended) than in STC-1, at 44 µg/L compared to 35 µg/L, respectively. However, outflow concentrations during the final 60 days of each test were indistinguishable at 16 and 17 µg/L. Exhibit 2-22 illustrates that TP outflow concentrations were initially high in both treatments and declined in a similar fashion to similar final concentrations. Cumulative TP removal was also similar in both treatments (Exhibit 2-23), as were average  $k_{1TP}$  estimates (Exhibit 2-24). Based on these data, there does not appear to be a measurable effect of the soil amendment on either the TP mass removal or attainable outflow TP concentration at the PSTA Test Cell scale.

### **2.3.2 Porta-PSTAs**

Porta-PSTA Treatments PP-1 (Phase 1) and PP-13 (Phase 2) provide an evaluation of effects before and after peat soil amendment with lime at the smaller mesocosm scale. Averages for each of these treatments include three replicate mesocosms. Average water depths in these treatments were 65 and 33 cm, respectively (Exhibit 2-25). Average inflow TP concentration was higher during Phase 2 (32 µg/L) than in Phase 1 (21 µg/L). POR (180-day) outflow TP concentrations were similar between the un-amended and amended soil treatments at 21 µg/L and 19 µg/L. However, outflow TP concentrations were considerably lower in the amended treatment than in the un-amended treatment during the final 60 days (13 µg/L vs. 20 µg/L, respectively) in spite of the observation that inflow TP was higher during this period during Phase 2. Treatment PP-13 did not show the same pattern of an initial high outflow TP concentration as Treatment PP-1 (Exhibit 2-25). This Phase 1 vs. Phase 2 difference was similar in the un-amended control treatment for these same periods (PP-3).

Cumulative TP mass removal and monthly  $k_{1TP}$  values were higher in the Phase 2 lime-amended Porta-PSTA treatment than in the Phase 1 un-amended treatment (Exhibit 2-21 and Exhibits 2-26 and 2-27). However, the same pattern was seen in Treatment PP-3 during Phase 1 and Phase 2, only to a lesser extent. If PP-3 is considered a control of the effects between Phase 1 and Phase 2, then there was a significant benefit from liming in PP-13 during the last 60 days of this comparison, with lower average TP outflow concentration and higher mass removal and  $k_{1TP}$  (Exhibit 2-21). These data indicate that there was a measurable effect on TP mass removal and minimum attainable outflow concentration that could be attributed to amendment of the peat soils with lime in these Porta-PSTA mesocosms.

### **2.3.3 Synthesis of Information on Soil Amendment Effects**

Data from Phases 1 and 2 of the PSTA Research and Demonstration Project for the Test Cell mesocosm amended with hydrated lime at approximately 7 mt/ha indicate that there was no measurable benefit on either mass of TP removed or attainable TP outflow concentration. In contrast, results from the Porta-PSTAs indicate a benefit of liming. The pattern of very high initial TP outflow concentrations observed at the Test Cell scale was not duplicated in the Porta-PSTA treatments during the Phase 2 operational period. This may partially be because of the different sources and initial conditions of the peat soils used in these mesocosms as well as to the effects of scale (e.g., more wind-induced mixing in the Test Cells). It is also potentially the result of the manner in which the lime was introduced at each mesocosm scale. In the Test Cells, the lime was added by walking throughout the cell,

causing significant disturbance to the mucky soils; in the Porta-PSTAs, lime was added from outside the tanks, with minimal soil disturbance. Lime addition without stirring may be critical to sealing off the flux of newly exposed sediments to the water column. This type of addition may be extremely difficult on a large scale.

This test does not prove whether soil amendments are effective in general, just that using the chemical choice, loading, and application methods tested in the PSTA mesocosms did not have a clear or consistent effect. The laboratory study reported by Ann et al. (2000) indicated that this rate of loading of lime should have totally immobilized soluble reactive P release from these soils. DRP concentrations in the PSTA tests were extremely low in all treatments (typically less than 3 µg/L in the outflows), and their reduction because of liming was not examined in this study. In the laboratory tests it was possible to effectively mix the lime amendment throughout the soil sample. That type of addition may not be feasible at a field scale. Also, the PSTA study did not focus on the release of DRP to the water column, but rather on the effect of the lime amendment on the net reduction of total P. These data indicate that extrapolation from laboratory or even small mesocosms to larger field-scale or full-scale treatment systems and from one form of P to another form must be made with caution.

Based on research to date, it appears it is possible to achieve outflow concentrations from peat-based PSTAs below 15 µg/L without soil amendment. Lower TP outflow concentrations might be possible at the field-scale site if antecedent soil TP concentrations are lower. In addition, the Porta-PSTA Phase 2 data indicate that it might be possible to lower average TP outflow concentrations even further by adding lime, as long as this application can be made without stirring the soils.

## 2.4 TP Mass Removal Summary

### 2.4.1 Average $k_{1TP}$ Estimates

Exhibit 2-28 provides a preliminary summary comparison of average TP outflow concentrations for all of the Phase 2 treatments. Two summaries are provided: one for the entire Phase 2 period (extending from April through October 2000 to capture the last Porta-PSTA sampling event in early October) and one for the period from July through October. The purpose of providing this second summary is to allow evaluation of mesocosm performance for the period after initial start-up phenomena in some of the new treatments was complete.

For the Porta-PSTA treatments, the lowest average Phase 2 TP outflow concentration was recorded as 14 µg/L in PP-17 (HCl-rinsed sand). Additional low outflow TP concentrations were recorded in treatments PP-4, PP-7, and PP-19 at 15 µg/L. These three treatments have shellrock, sand, and no soils, respectively. The lowest average outflow TP concentration during this phase for peat-soil treatments was 19 µg/L. The lowest Phase 2 average outflow TP concentrations were recorded in the PSTA Test Cell mesocosms with shellrock soils (STC-5 and STC-6) at 12 µg/L and 14 µg/L, respectively. Lower outflow concentrations for the last 3 to 4 months of the project period were observed for all treatments, perhaps in response to lower average TP inflow concentrations. One sand and one non-soil Porta-PSTA treatment each achieved an average TP outflow of 11 µg/L during this period, and both

**EXHIBIT 2-28**

Phase 2 PSTA Performance Summary - Period of Record vs. Post-Start Up Comparison

Treatment	Description	April-October 2000				July-October 2000			
		HLR (cm/d)	TP In ( $\mu\text{g}/\text{L}$ )	TP Out ( $\mu\text{g}/\text{L}$ )	$k_1$ (m/yr)	HLR (cm/d)	TP In ( $\mu\text{g}/\text{L}$ )	TP Out ( $\mu\text{g}/\text{L}$ )	$k_1$ (m/yr)
PP-3	Peat 1x6	7.4	32	19	15.0	7.8	22	18	6.2
PP-4	Shellrock 1x6	7.6	32	15	20.8	8.4	22	13	15.4
PP-7	Sand 1x6	7.6	31	15	20.3	8.2	21	13	14.0
PP-11	Shellrock 3x6	8.0	32	20	13.6	9.3	21	17	8.3
PP-12	Peat 3x6	7.9	31	21	11.9	8.7	21	17	7.5
PP-13	Peat (CaOH) 1x6	8.1	31	19	14.7	8.7	22	15	13.0
PP-14	Limerock (1x6)	8.0	31	16	19.4	8.6	22	13	16.1
PP-15	Shellrock (recycle) 1x6	7.2	31	18	14.5	7.8	22	14	13.3
PP-16	Shellrock (dryout) 1x6)	15.1	26	17	21.6	18.0	22	16	19.7
PP-17	Sand (HCl) 1x6	7.6	31	14	21.8	7.6	21	11	18.5
PP-18	No-Substrate 1x6	8.1	31	17	17.9	7.9	22	13	14.8
PP-19	Aquamat 1x6	7.6	31	15	19.0	8.1	21	11	19.3
STC-4	Peat (CaOH) 1x6	5.1	24	35	-7.1	5.1	24	15	8.4
STC-5	Shellrock	5.2	23	12	11.9	5.1	23	12	12.9
STC-6	Shellrock (dryout) 1x6)	6.3	26	14	13.8	9.3	25	12	24.8

Note: all Phase 2 (April - October, 2000) treatments average 30 cm water depth.

shellrock Test Cells achieved averages of 12  $\mu\text{g}/\text{L}$ . Several of the peat mesocosms achieved average TP outflow concentrations of 15  $\mu\text{g}/\text{L}$ .

Exhibit 2-28 also provides a summary of Phase 2 average  $k_{1\text{TP}}$  values. The highest recorded Phase 2 average  $k_{1\text{TP}}$  values were in PP-16 and PP-17 at approximately 22 m/y. These are the shellrock dry-out treatment and the HCl-rinsed sand control, respectively. Porta-PSTA shell rock and sand treatments also had high  $k_{1\text{TP}}$  values of more than 20 m/y. The highest average  $k_{1\text{TP}}$  values in peat treatments were approximately 15 m/y. The highest average  $k_{1\text{TP}}$  value measured in the PSTA Test Cells was 13.8 m/y in STC-6, the shellrock dryout treatment. The steady-depth shellrock treatment averaged 11.9 m/y, while the calcium-amended peat treatment averaged -7.1 m/y. Average  $k_{1\text{TP}}$  values were lower for all Porta-PSTA treatments during the last 3 to 4 months of this Phase 2 period because of the lower TP mass loading. However, the average  $k_{1\text{TP}}$  values estimated for the PSTA Test Cells were all higher. While  $k_{1\text{TP}}$  for treatment STC-5 was consistent for these two averaging periods (no changes in operation), the average  $k_{1\text{TP}}$  values for the peat treatment (STC-4) and the dry-out shellrock treatment (STC-6) were both much higher during the later part of the study period, apparently in response to the amount of time since disturbance (at the beginning of Phase 2, STC-4 was limed and STC-6 went through dry-out).

#### 2.4.2 $k_{1\text{TP}}$ Correlations

A number of other chemical and physical factors may be influencing TP removal rate constants. For example, data analyses summarized in the Phase 1 PSTA report indicated that  $k_{1\text{TP}}$  is a function of the minimum achievable outflow TP concentration ( $C^*$ ). The same mass removal will result in a lower value of  $k_{1\text{TP}}$ , if  $C^*$  is lower.

Other factors that might influence values of  $k_{1\text{TP}}$  include dissolved oxygen (DO), dissolved calcium (Ca), TP inflow concentration, HLR, and TP mass loading rate. Each of these potential relationships was examined by regressing the independent factor (DO, Ca, TP in, HLR, or TP mass loading rate) against  $k_{1\text{TP}}$  for the entire data set to date from both project

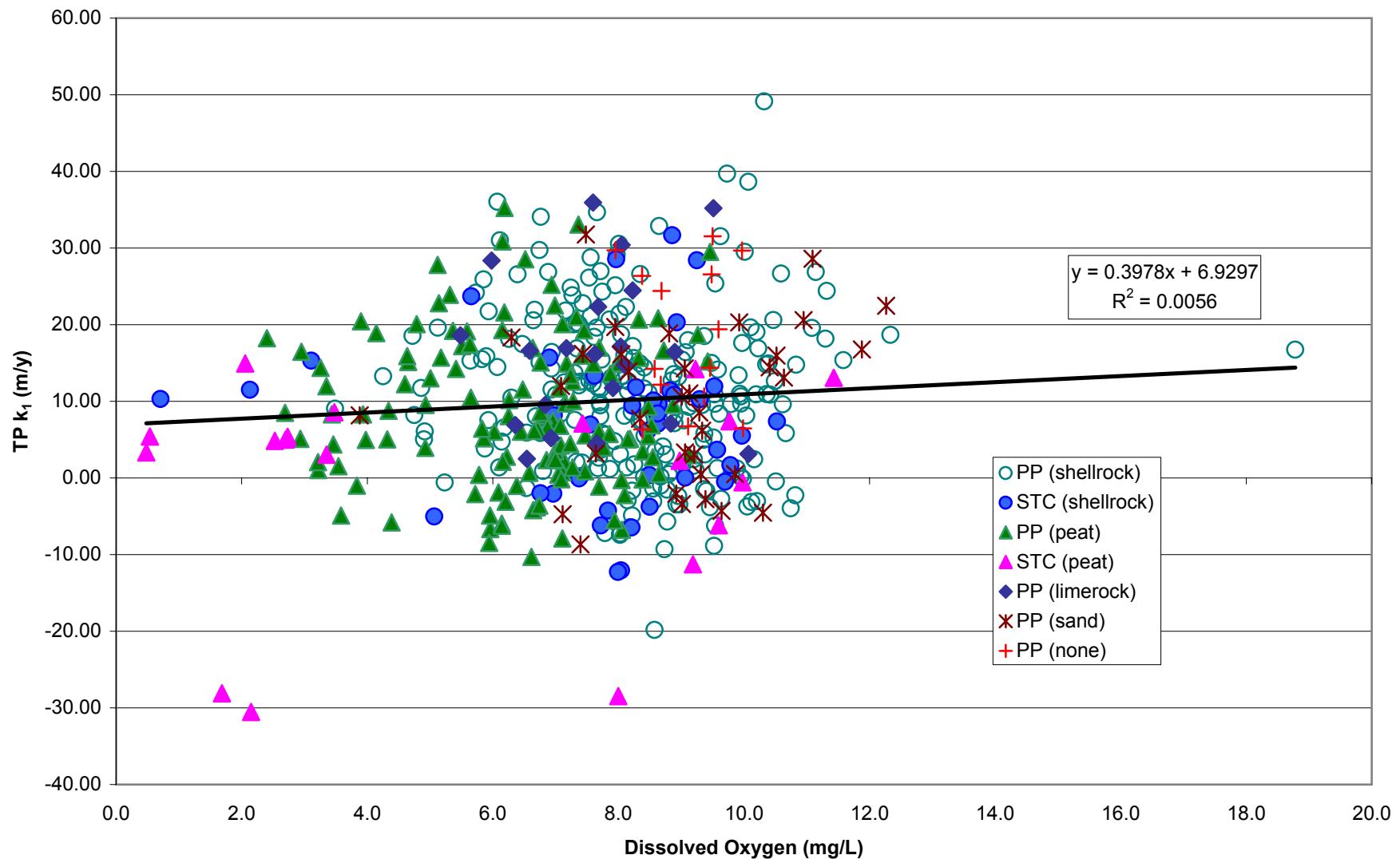
periods. Monthly averages were used in this analysis. Exhibits 2-29 to 2-33 illustrate these regression analyses.

Exhibit 2-29 illustrates the relationship between outflow DO and  $k_{1TP}$ . No effect of DO on the TP removal rate constant was found. Exhibit 2-30 presents a plot of Ca inflow concentration vs.  $k_{1TP}$  for all of the PSTA treatments. A very slight positive correlation was observed between these parameters, but very little of the variation in  $k_{1TP}$  is explained by Ca concentration.

Exhibit 2-31 is a plot of TP inflow concentration vs.  $k_{1TP}$ . While the regression is better than for the previous two variables, inflow concentration alone is not a good predictor of TP mass removal rate.

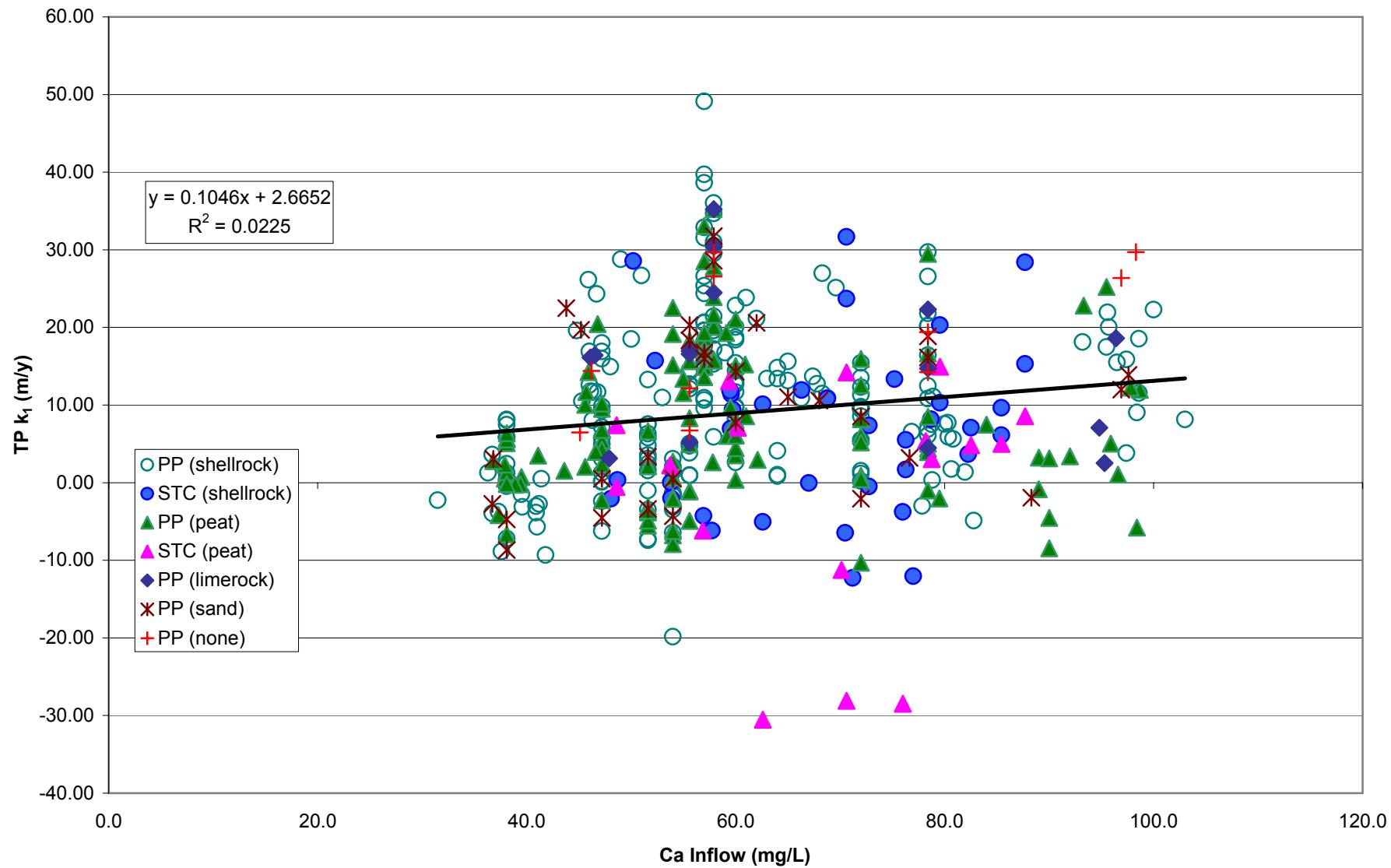
Exhibit 2-32 demonstrates a stronger relationship between HLR and  $k_{1TP}$ . The  $R^2$  for this regression is 0.21. All of the soil types at both mesocosm scales appear to fall on the same central tendency line.

Exhibit 2-33 displays the regression between TP mass loading and  $k_{1TP}$ . The  $R^2$  for this relationship is 0.44. It is recognized that  $k_{1TP}$  is not independent of TP mass loading rate and that the observed relationship is at least partially the result of auto-correlation. However, these figures illustrate how higher  $k_{1TP}$  values typically result from higher inflow TP concentrations and HLRs. This relationship will be important in Supplemental Technology Standards of Comparison (STSOC) testing of the PSTA concept. Because  $k_{1TP}$  is shown to be a function of TP mass loading, it will be possible to extrapolate to the relatively wide range of loadings inherent in the STA-2 10-year POR data set used for comparison of alternative advanced technologies.



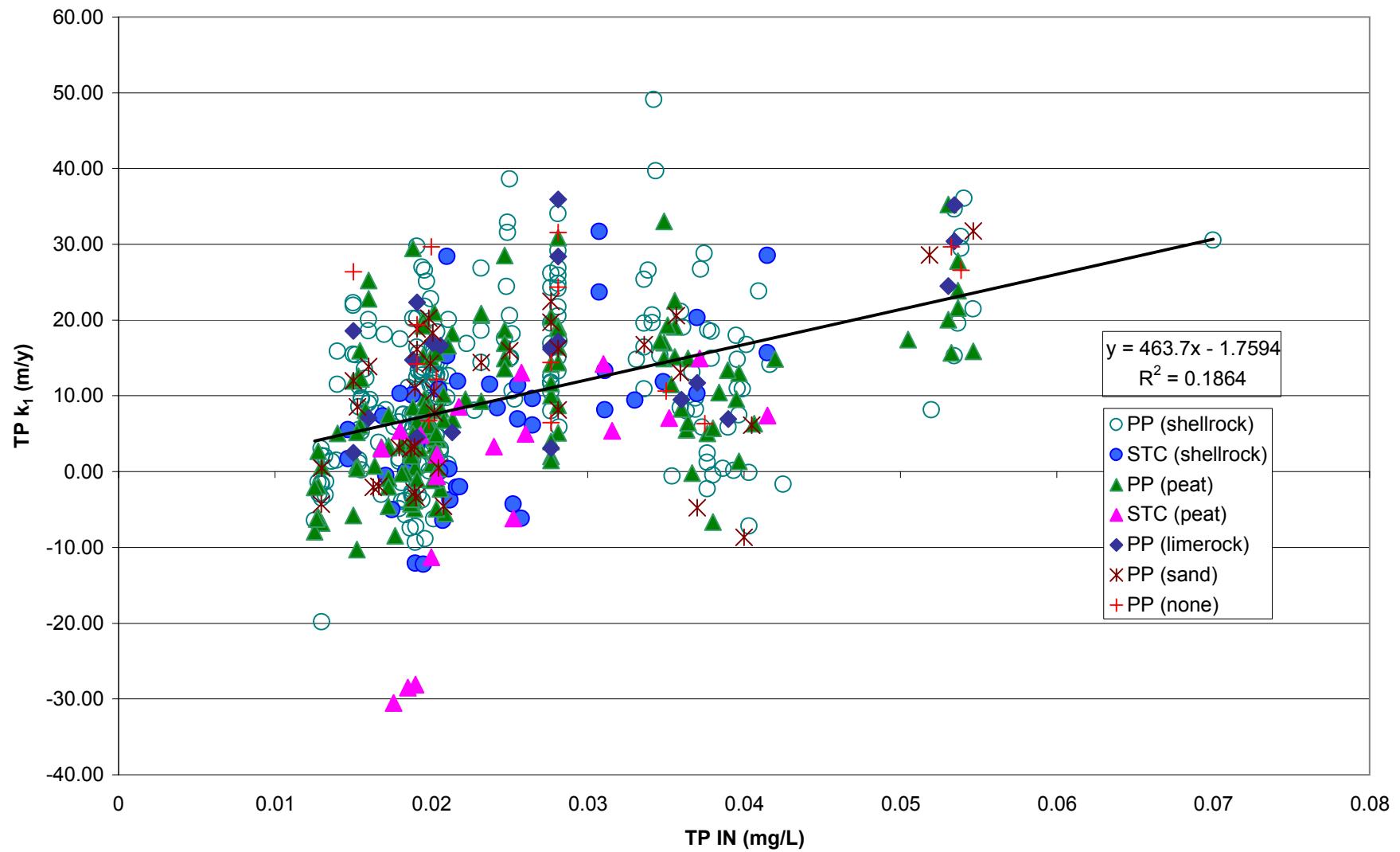
#### EXHIBIT 2-29

Relationship Between Outflow Dissolved Oxygen and  $k_{TP}$  for the PSTA Mesocosms for the Period-of-Record



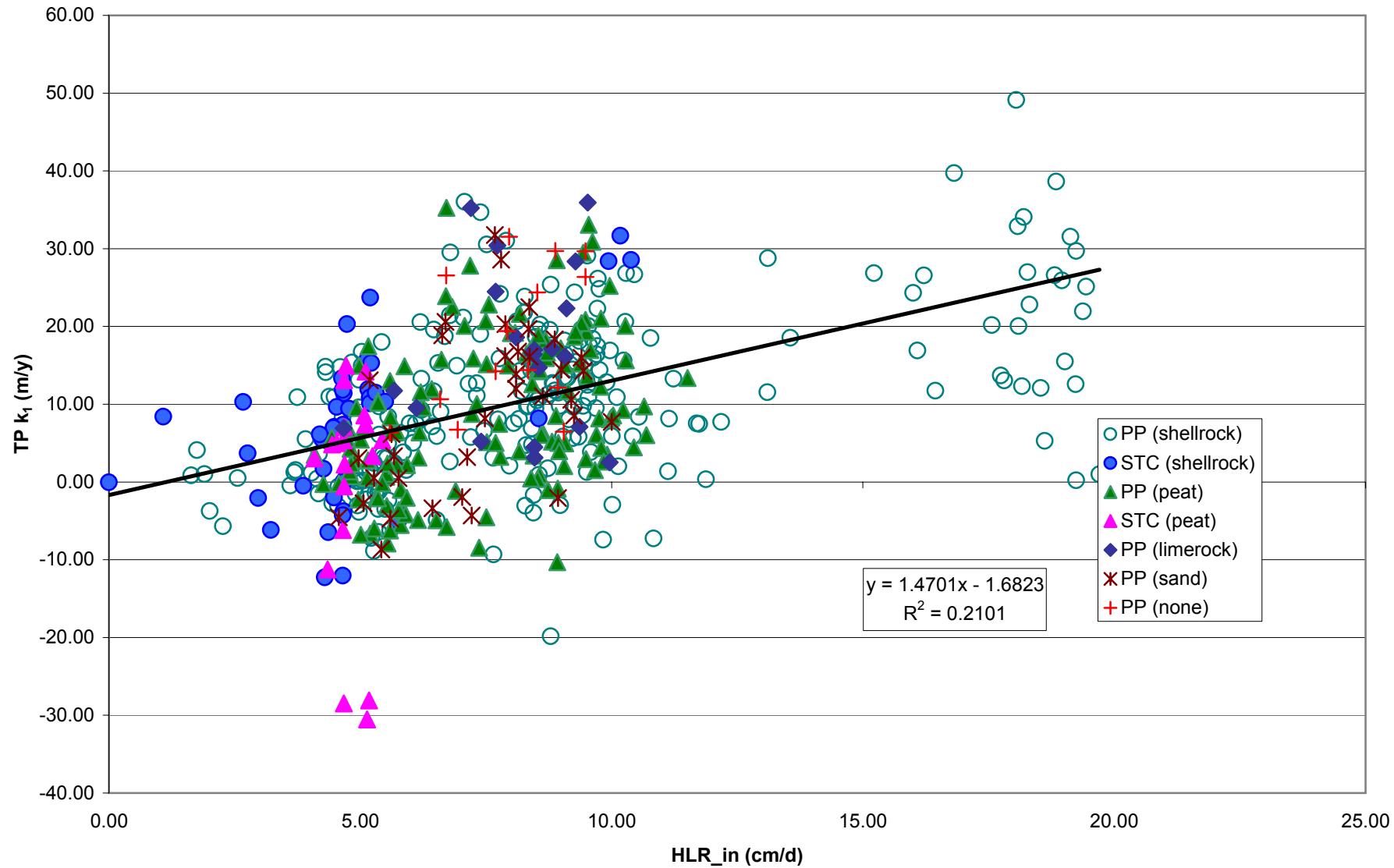
#### EXHIBIT 2-30

Relationship Between Inflow Calcium and  $k_{1\text{TP}}$  for the PSTA Mesocosms for the Period-of-Record



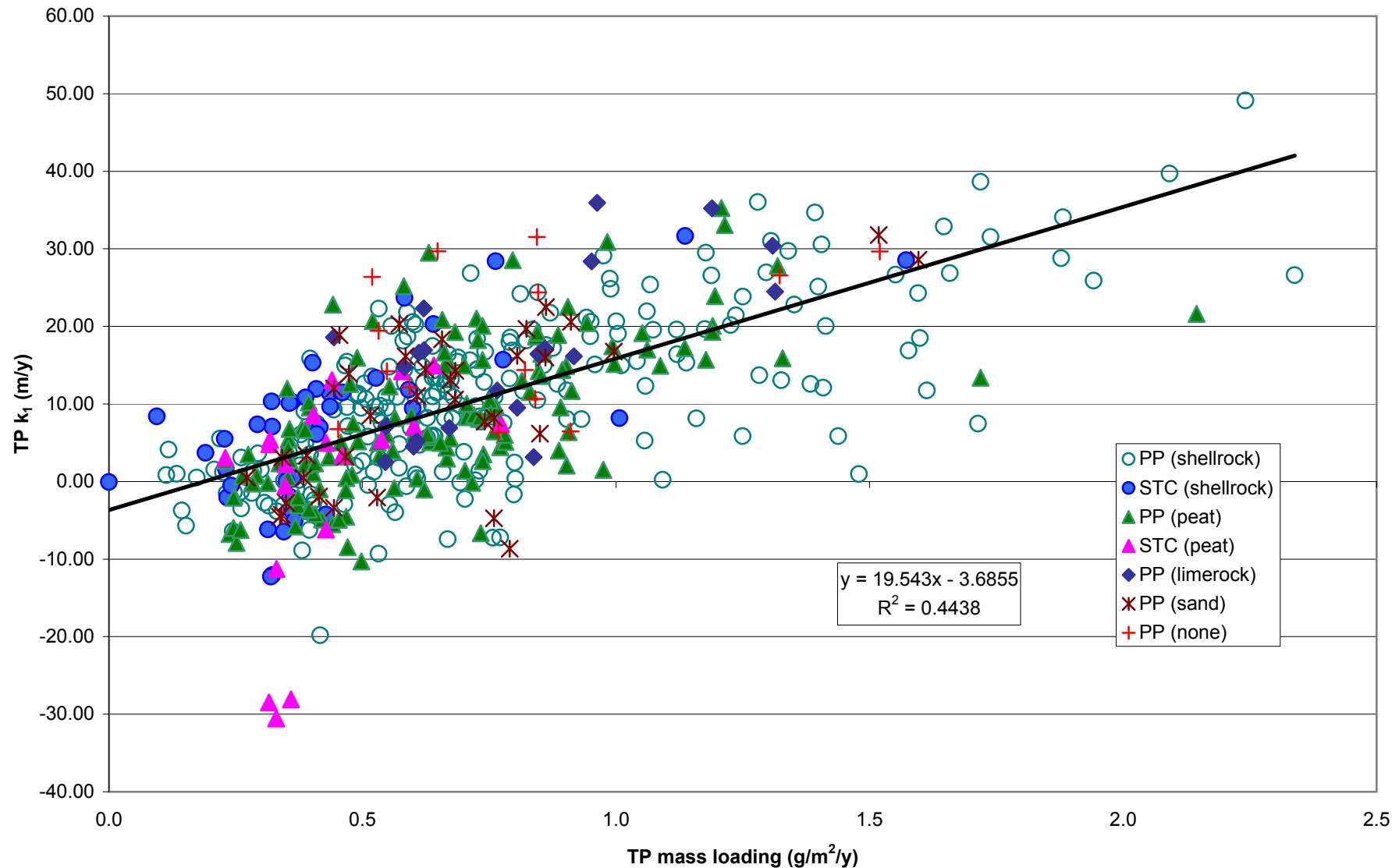
### EXHIBIT 2-31

Relationship Between Inflow TP and  $k_{TP}$  for the PSTA Mesocosms for the Period-of-Record



#### EXHIBIT 2-32

Relationship Between Inflow HLR and  $k_{1\text{TP}}$  for the PSTA Mesocosms for the Period-of-Record



### EXHIBIT 2-33

Relationship Between Inflow TP Mass Loading Rate and  $k_{TP}$  for the PSTA Mesocosms for the Period-of-Record

# Community Development and Viability

---

## 3.1 Introduction

One important aspect of evaluating the PSTA concept is developing a quantitative understanding of the ecological structure and function of the periphyton-dominated plant community. The PSTA Research and Demonstration Project is monitoring a number of ecological parameters to provide a characterization of the viability of the PSTA ecosystem. These parameters include algal species identifications, biomass estimates, chlorophyll estimates, algal mat and emergent plant coverage, accretion rates of new sediments, and measures of community metabolism.

This section briefly summarizes Phase 2 data relevant to these PSTA viability issues. These analyses are preliminary and will be updated for the entire Phase 2 period in the final project report.

## 3.2 Algal Taxonomic Composition

A total of 191 algal taxa were identified in PSTA periphyton samples collected during Phase 2. The appendices provide detailed lists of the algal cell counts and monthly totals by individual taxa for Phase 2. The number of species observed in the Phase 2 PSTA Test Cells and Porta-PSTAs were 115 and 180, respectively.

Exhibit 3-1 provides a summary of the Phase 2 algal taxonomic data. Dominant taxa were in the blue-green (Cyanophyceae), diatom (Bacillariophyceae), and green (Chlorophyta) algal groups. The highest algal cell counts and biovolumes were measured in the non-soil control tank (PP-18). The lowest algal populations were in two of the peat treatments (PP-12 and PP-13). All mesocosms had relatively high algal diversities, with average Shannon-Weiner diversity indices between 2.9 and 3.4, and from 21 to 31 algal species per count. Evenness in all samples averaged between 0.65 and 0.73.

## 3.3 Periphyton Biomass and Chlorophyll Content

Periphyton core samples were also analyzed for their dry and ash-free dry weight biomass, chlorophyll *a*, pheophytin. Exhibit 3-2 summarizes the Phase 2 average data for these parameters by treatment.

Average Phase 2 periphyton dry weight biomass varied from a low of 273 grams per square meter ( $\text{g}/\text{m}^2$ ) in the dry-down PSTA Test Cell (STC-6) to 1,990  $\text{g}/\text{m}^2$  in the calcium-amended peat Porta-PSTA (PP-13). Ash-free dry weight biomass varied from a low of 86  $\text{g}/\text{m}^2$  to a high of 1,041  $\text{g}/\text{m}^2$ , respectively, for these two extremes. The peat-based

**EXHIBIT 3-1**

Average Phase 2 PSTA Periphyton Community Data - Algal Populations

Treatment	Description	Blue Green Algae		Diatoms		Green Algae		Other Taxa		Total Taxa		Biovolume (cm <sup>3</sup> /m <sup>2</sup> )	Evenness	SWDI
		cells/ m <sup>2</sup> *10 <sup>6</sup>	(# taxa)											
PP-3	Peat 1x6	130632	12	2803	9	1967	6	14	<1	135416	28	13.32	0.68	3.21
PP-4	Shellrock 1x6	270384	15	7349	8	1676	3	20	<1	267025	26	15.22	0.69	3.19
PP-7	Sand 1x6	589260	15	8797	8	2559	2	32	<1	600008	25	30.06	0.72	3.33
PP-11	Shellrock 3x6	453681	18	8996	7	5986	6	0	<1	468662	31	21.62	0.68	3.37
PP-12	Peat 3x6	25468	11	1605	11	1007	7	0	<1	28080	29	5.33	0.64	3.09
PP-13	Peat (CaOH) 1x6	38702	10	2770	9	1906	5	46	<1	43417	24	7.87	0.70	3.19
PP-14	Limerock (1x6)	305566	16	6658	6	3278	5	9	<1	315507	27	25.17	0.69	3.39
PP-15	Shellrock (recycle) 1x6	202675	14	4666	7	3150	5	15	<1	210507	26	24.73	0.71	3.30
PP-16	Shellrock (dryout) 1x6	400332	17	5650	5	4314	3	32	<1	405825	25	29.25	0.72	3.31
PP-17	Sand (HCl) 1x6	533352	16	4174	5	6258	3	0	<1	543897	25	33.79	0.73	3.38
PP-18	No-Substrate 1x6	814816	13	12587	6	13264	3	20	<1	840686	22	103.54	0.65	2.86
PP-19	Aquamat 1x6	477110	14	3423	6	1750	3	0	<1	481991	21	25.27	0.65	2.86
STC-4	Peat (CaOH) 1x6	116587	11	10836	9	2903	5	55	<1	122218	23	20.56	0.65	2.93
STC-5	Shellrock	247658	14	9028	9	1656	4	0	<1	258342	27	22.23	0.69	3.24
STC-6	Shellrock (dryout) 1x6	269392	13	27249	7	3958	4	0	<1	275761	22	11.90	0.69	3.03

**Notes:**

Phase 2 = (April 2000 - October 2000)

SWDI = Shannon-Weaver Diversity Index

Periphyton taxonomy conducted on a quarterly basis for PP-3, 4, 7, 11, and 12 and STC-5 beginning in July 2000.

**EXHIBIT 3-2**

Average Phase 2 PSTA Periphyton Community Data - Biomass, Chlorophyll, and Chemistry

<b>Treatment</b>	<b>Description</b>	<b>Periphyton Biomass (g/m<sup>2</sup>)</b>			<b>Ca (g/m<sup>2</sup>)</b>	<b>Chl_a (corr) (mg/m<sup>2</sup>)</b>	<b>Pheo_a (mg/m<sup>2</sup>)</b>	<b>TP (g/m<sup>2</sup>)</b>	<b>TIP (g/m<sup>2</sup>)</b>	<b>TKN<sup>a</sup> (g/m<sup>2</sup>)</b>
		<b>Dry Wt</b>	<b>Ash Wt</b>	<b>AFDW</b>						
PP-3	Peat 1x6	734	313	421	61	166	51.6	0.413	0.140	11.07
PP-4	Shellrock 1x6	584	501	120	150	153	11.2	0.362	0.182	2.23
PP-7	Sand 1x6	828	668	160	119	158	7.2	0.113	0.031	1.80
PP-11	Shellrock 3x6	909	730	179	156	203	3.3	0.528	0.170	3.85
PP-12	Peat 3x6	610	345	347	50	103	38.5	0.379	0.125	2.69
PP-13	Peat (CaOH) 1x6	1990	912	1041	259	86	31.3	0.723	0.422	5.04
PP-14	Limerock (1x6)	416	301	115	98	120	5.9	0.219	0.133	2.20
PP-15	Shellrock (recycle)	415	321	219	86	92	4.5	0.260	0.106	1.81
PP-16	Shellrock (dryout)	947	785	163	225	173	17.7	0.735	0.399	3.89
PP-17	Sand (HCl) 1x6	877	684	192	154	212	7.8	0.140	0.043	5.21
PP-18	No-Substrate 1x6	924	637	287	198	246	3.9	0.187	0.102	3.01
PP-19	Aquamat 1x6	663	488	175	118	156	4.3	0.225	0.158	1.52
STC-4	Peat (CaOH) 1x6	1153	792	361	237	175	42.0	0.690	0.362	7.68
STC-5	Shellrock	340	239	102	96	197	16.4	0.156	0.038	3.39
STC-6	Shellrock (dryout)	273	191	86	105	106	13.7	0.298	0.130	5.61

Notes:

Phase 2 = (April 2000 - October 2000)

TKN analyzed on a quarterly basis.

mesocosms had the highest estimated periphyton biomasses (average dry weight of 1,122 g/m<sup>2</sup> across all peat treatments), while the shellrock treatments averaged 578 g/m<sup>2</sup>. The average limerock biomass was slightly lower at 416 g/m<sup>2</sup> (starting from zero at the beginning of the Phase 2 period), and the sand and non-substrate control mesocosms had biomass levels between the shellrock and peat mesocosms. As mentioned in the *Phase 1 Summary Report* (CH2M HILL, August 2000), the peat biomass estimates are likely high because of the unavoidable inclusion of some peat sediment in the samples.

Chlorophyll and pheophytin values provide an estimate of the amount of photosynthetic matter present in the periphyton samples. Data across treatments are relatively consistent for these parameters. Average Phase 2 corrected chlorophyll *a* ranged from 86 to 246 mg/m<sup>2</sup> with no clear trends between treatments. Pheophytin estimates were typically highest in the peat mesocosms, indicating that these periphyton communities have a greater fraction of senescing algae than the other treatments.

### 3.4 Periphyton Chemical Composition

Exhibit 3-2 also summarizes data for calcium, phosphorus, and total Kjeldahl nitrogen (TKN) content of the periphyton. Calcium content was relatively consistent across treatments with no clear trend, ranging from 50 to 259 g/m<sup>2</sup>. Average Phase 2 periphyton TP concentrations were typically highest in the peat and shellrock mesocosms. Total inorganic

phosphorus (TIP) concentrations were more variable between treatments, with the lowest values measured in the sand Porta-PSTA tanks and in one of the shellrock Test Cells (STC-5). TKN concentrations were typically, but not consistently, highest in the peat-based mesocosms.

### 3.5 Macrophytes

During Phase 2, Porta-PSTA mesocosms have been tested with and without the presence of macrophytes. However, it is considered unlikely that larger-scale PSTA systems can remain free of macrophytes without significant intervention. Also, sparse macrophyte communities are likely to be helpful for maintaining higher periphyton populations by providing attachment sites and anchoring against wind-induced periphyton movement. For these reasons, the majority of the PSTA treatments intentionally contain macrophytes, specifically spike-rush (*Eleocharis cellulosa*) and bladderwort (*Utricularia* sp.). One goal of the project is the documentation of the growth rate and density of these macrophytes to attempt to identify a macrophyte density and control strategy that optimizes periphyton development and overall system P removal performance.

Exhibit 3-3 summarizes the Phase 2 macrophyte results for August 2000. This sampling event was generally near the peak of macrophyte community development in most treatments and avoids a comparison between new and mature mesocosms. Detailed monthly data are provided in the appendices. Cover numbers are visual estimates for comparison purposes and do not provide an accurate assessment of total leaf cover. Biomass values are from plants collected in periphyton core samples. Macrophyte stem (live) counts were only conducted in the Porta-PSTA mesocosms.

In the Porta-PSTAs with plants, emergent macrophytes occupied from 3 to 83 percent by cover, and submerged aquatic plants occupied from 0 to 26 percent. All emergents were spikerush (a few volunteer cattails [*Typha latifolia*] were pulled), and submerged plants were typically bladderwort and chara [*Chara* sp.].

Principal volunteer macrophytic plant species in the PSTA Test Cells were cattails, hydrilla (*Hydrilla verticillata*), and the macro-algae chara. Based on visual estimates, the emergent macrophyte cover in the PSTA Test Cells ranged from 14 to 48 percent, and submerged macrophyte cover ranged from 68 to 100 percent. The lowest macrophyte cover estimates were generally in the new treatments that had been started over in April 2000. Macrophyte dry weight biomass estimates for August 2000 ranged from 0 to 471 g/m<sup>2</sup>. Stem counts in the Porta-PSTAs ranged from 0 to 385 stems/m<sup>2</sup>.

Of the long-term treatments that did not have their Phase 1 plants removed (PP-3, 4, 7, 11, 12, 15, and 16, and STC-5 and 6), the sand control had the lowest macrophyte cover in August 2000 and shellrock emergent macrophyte cover estimates, and stem counts were typically lower than in peat-soil mesocosms.

**EXHIBIT 3-3**

Phase 2 PSTA Macrophyte Cover and Biomass Data for August 2000

Treatment	Description	Emergent Macrophytes	Submerged Aquatic Plants	Total Macrophyte % Cover	Macrophyte Biomass (g/m <sup>2</sup> )	No. Stems/ m <sup>2</sup>
PP-3	Peat 1x6	51%	1%	52%	415	359
PP-4	Shellrock 1x6	11%	6%	18%	141	161
PP-7	Sand 1x6	5%	0%	5%	66	105
PP-11	Shellrock 3x6	54%	0%	54%	395	319
PP-12	Peat 3x6	83%	0%	83%	471	385
PP-13	Peat (CaOH) 1x6	6%	26%	32%	75	99
PP-14	Limerock (1x6)	3%	0%	3%	5	40
PP-15	Shellrock (recycle) 1x6	42%	14%	56%	175	239
PP-16	Shellrock (dryout) 1x6)	14%	1%	15%	93	81
PP-17	Sand (HCl) 1x6	3%	0%	3%	0	62
PP-18	No-Substrate 1x6	0%	0%	0%	0	0
PP-19	Aquamat 1x6	0%	0%	0%	0	0
STC-4	Peat (CaOH) 1x6	14%	100%	114%	466	-
STC-5	Shellrock	48%	97%	145%	415	-
STC-6	Shellrock (dryout) 1x6)	46%	68%	113%	70	-

## Notes:

Macrophyte percent cover is visually estimated using a semi-quantitative method.

Macrophyte biomass is estimated from periphyton core samples.

Stem counts are for live stems only.

### 3.6 Consumer Populations

Snail populations were not routinely inventoried during Phase 2. However, snails were harvested by hand from 20 of the 24 Porta-PSTA tanks in July 2000. Exhibit 3-4 summarizes the number of snails harvested. In the treatments sampled, the total number of harvested snails ranged from 0 to approximately 44 per m<sup>2</sup>. Highest snail densities were observed in shellrock treatments (PP-4 and PP-16). Exhibit 3-4 reflects that for some of the treatments, significantly different snail populations developed in the replicate tanks. Differential degrees of grazing is a likely factor contributing to variability in the within-treatment data-sets.

### 3.7 Community Metabolism/Productivity

Previous metabolism estimates relied upon an assumed oxygen diffusion rate for correcting oxygen-rate-of-change data. The estimated rate was 0.1 grams of oxygen per square meter per hour (g O<sub>2</sub>/m<sup>2</sup>/hr.). Floating-dome diffusion studies were conducted in several of the Porta-PSTA and PSTA Test Cell mesocosms during Phase 2. Exhibit 3-5 summarizes the data from these studies. Diffusion rates were found to be affected by nominal velocity and

**EXHIBIT 3-4**

Snails Collected in the Porta-PSTA Mesocosms, July 2000

Treatment	Tank	7/12-13/2000		07/27/2000		Cell Total (#/m <sup>2</sup> )			Treatment Total (#/m <sup>2</sup> )		
		<i>Helisoma</i>	<i>Physa</i>	<i>Helisoma</i>	<i>Physa</i>	<i>Helisoma</i>	<i>Physa</i>	Total	<i>Helisoma</i>	<i>Physa</i>	Total
3	12	20	0	ns	ns	3.3	0.0	3.3	13.5	3.0	16.5
3	14	13	4	ns	ns	2.2	0.7	2.8			
3	17	ns	ns	48	14	8.0	2.3	10.3			
4	3	54	3	ns	ns	9.0	0.5	9.5	43.2	0.7	43.8
4	5	63	1	ns	ns	10.5	0.2	10.7			
4	10	142	0	ns	ns	23.7	0.0	23.7			
7	19	ns	ns	6	0	1.0	0.0	1.0	1.0	0.0	1.0
13	9	0	0	ns	ns	0.0	0.0	0.0	0.0	0.0	0.0
13	11	0	0	ns	ns	0.0	0.0	0.0			
13	18	ns	ns	0	0	0.0	0.0	0.0			
14	4	12	2	ns	ns	2.0	0.3	2.3	6.8	0.3	7.2
14	7	15	0	ns	ns	2.5	0.0	2.5			
14	8	14	0	ns	ns	2.3	0.0	2.3			
15	2	11	0	ns	ns	1.8	0.0	1.8	8.0	2.7	10.7
15	13	37	3	ns	ns	6.2	0.5	6.7			
15	16	ns	ns	0	13	0.0	2.2	2.2			
16	1	163	30	ns	ns	27.2	5.0	32.2	33.5	5.3	38.8
16	6	21	0	ns	ns	3.5	0.0	3.5			
16	15	17	2	ns	ns	2.8	0.3	3.2			
17	20	ns	ns	71	4	11.8	0.7	12.5	11.8	0.7	12.5

**Note:**

ns = not sampled

**EXHIBIT 3-5**

## Diffusion Rate Measurements in the PSTA Mesocosms

Date	Tank/Cell	Treatment	Depth (cm)	HLR (cm/d)	Substrate	Other	Diffusion Rate (g/m <sup>2</sup> /h)
09/07/2000	2	PP-15	30	6	shellrock	recirculation	0.013
09/07/2000	20	PP-17	30	6	sand <sup>1</sup>	--	0.005
11/01/2000	3	PP-4	30	6	shellrock	--	0.005
11/07/2000	16	PP-15	30	6	shellrock	recirculation	0.009
11/14/2000	23	PP-11	30	6	shellrock	--	0.005
09/08/2000	13	STC-4	30	6	peat	--	0.009
09/08/2000	8	STC-5	30	6	shellrock	--	0.009
11/01/2000	8	STC-5	30	6	shellrock	--	0.008
12/05/2000	13	STC-4	50	6	peat	--	0.011

Notes:

<sup>1</sup>acid washed sand

Diffusion rates used in metabolism estimates based on above measurements:

Typical Porta-PSTA: 0.005 g/m<sup>2</sup>/hRecirculation Porta-PSTA: 0.011 g/m<sup>2</sup>/hTest Cells: 0.00925 g/m<sup>2</sup>/h

mesocosm size. Average diffusion rates used for correction of metabolism data for Phase 2 were:

- Porta-PSTA = 0.005 g O<sub>2</sub>/m<sup>2</sup>/hr
- Porta-PSTA with re-circulation = 0.011 g O<sub>2</sub>/m<sup>2</sup>/hr
- PSTA Test Cell = 0.009 g O<sub>2</sub>/m<sup>2</sup>/hr

PSTA community metabolism data for August 2000 are summarized in Exhibit 3-6. These data provide a "snap-shot" of system productivity during the late summer, long enough after Phase 2 startup to allow periphyton development in the mesocosms. Detailed monthly average community metabolism data are provided in the appendices.

Gross primary productivity (GPP) during August ranged from a low of approximately 1.6 g O<sub>2</sub>/m<sup>2</sup>/d in the Aquamat control treatment (PP-19) to a high of 7.7 g O<sub>2</sub>/m<sup>2</sup>/d in the dry-out PSTA Test Cell treatment (STC-6). Metabolism reported as g O<sub>2</sub>/m<sup>2</sup>/d is approximately equal to g C/m<sup>2</sup>/d and one half of organic matter production or consumption. GPP was typically between 3 and 4 g O<sub>2</sub>/m<sup>2</sup>/d in most treatments. Community respiration (CR) ranged from a low of approximately 1.1 g O<sub>2</sub>/m<sup>2</sup>/d in the Aquamat treatment to a high of approximately 6.8 g O<sub>2</sub>/m<sup>2</sup>/d in the dry-out PSTA Test Cell. The ratio of GPP to CR (P/R ratio) varied from a low of 0.55 in treatment PP-3 (peat) to a high of 1.42 in the Aquamat control (PP-19). P/R ratios less than 1 indicate a net loss of biomass and a negative net primary productivity (NPP) as shown in Exhibit 3-6. Photosynthetic efficiencies ranged from a low of approximately 1 percent in the Aquamat control to a high of approximately 4.5 percent in the dry-out PSTA Test Cell mesocosm.

**EXHIBIT 3-6**

## PSTA Community Metabolism Data for August 2000

Treatment	Description	GPP(day) g/m <sup>2</sup> /d	CR(24hr) g/m <sup>2</sup> /d	P/R Ratio	NPP(24hr) g/m <sup>2</sup> /d	PAR(24hr) E/m <sup>2</sup> /d	Efficiency %
PP-3	Peat 1x6	1.699	3.102	0.55	-1.403	28.4	1.1
PP-4	Shellrock 1x6	4.159	4.342	0.96	-0.183	30.2	2.6
PP-7	Sand 1x6	4.394	4.526	0.97	-0.132	34.6	2.4
PP-11	Shellrock 3x6	4.082	3.881	1.05	0.201	30.8	2.5
PP-12	Peat 3x6	3.226	4.072	0.79	-0.846	33.0	1.9
PP-13	Peat (CaOH) 1x6	3.736	3.647	1.02	0.089	27.8	2.6
PP-14	Limerock (1x6)	4.235	4.275	0.99	-0.040	30.6	2.6
PP-15	Shellrock (recycle) 1x6	1.834	2.194	0.84	-0.360	30.2	1.2
PP-16	Shellrock (dryout) 1x6)	3.085	3.131	0.99	-0.045	34.8	1.7
PP-17	Sand (HCl) 1x6	3.017	2.453	1.23	0.564	31.9	1.8
PP-18	No-Substrate 1x6	2.739	2.356	1.16	0.382	36.2	1.4
PP-19	Aquamat 1x6	1.599	1.128	1.42	0.471	30.6	1.0
STC-4	Peat (CaOH) 1x6	2.333	3.842	0.61	-1.509	28.3	1.6
STC-5	Shellrock	3.295	5.082	0.65	-1.787	38.0	1.7
STC-6	Shellrock (dryout) 1x6)	7.693	6.849	1.12	0.844	32.5	4.5

**Notes:**

Photosynthetic efficiency is calculated with above-water PAR and the assumption that 1 g O<sub>2</sub>/m<sup>2</sup> equals 10 kcal and 1 Einstein (E) of photons equals 52.27 kcal.

## SECTION 4

# References

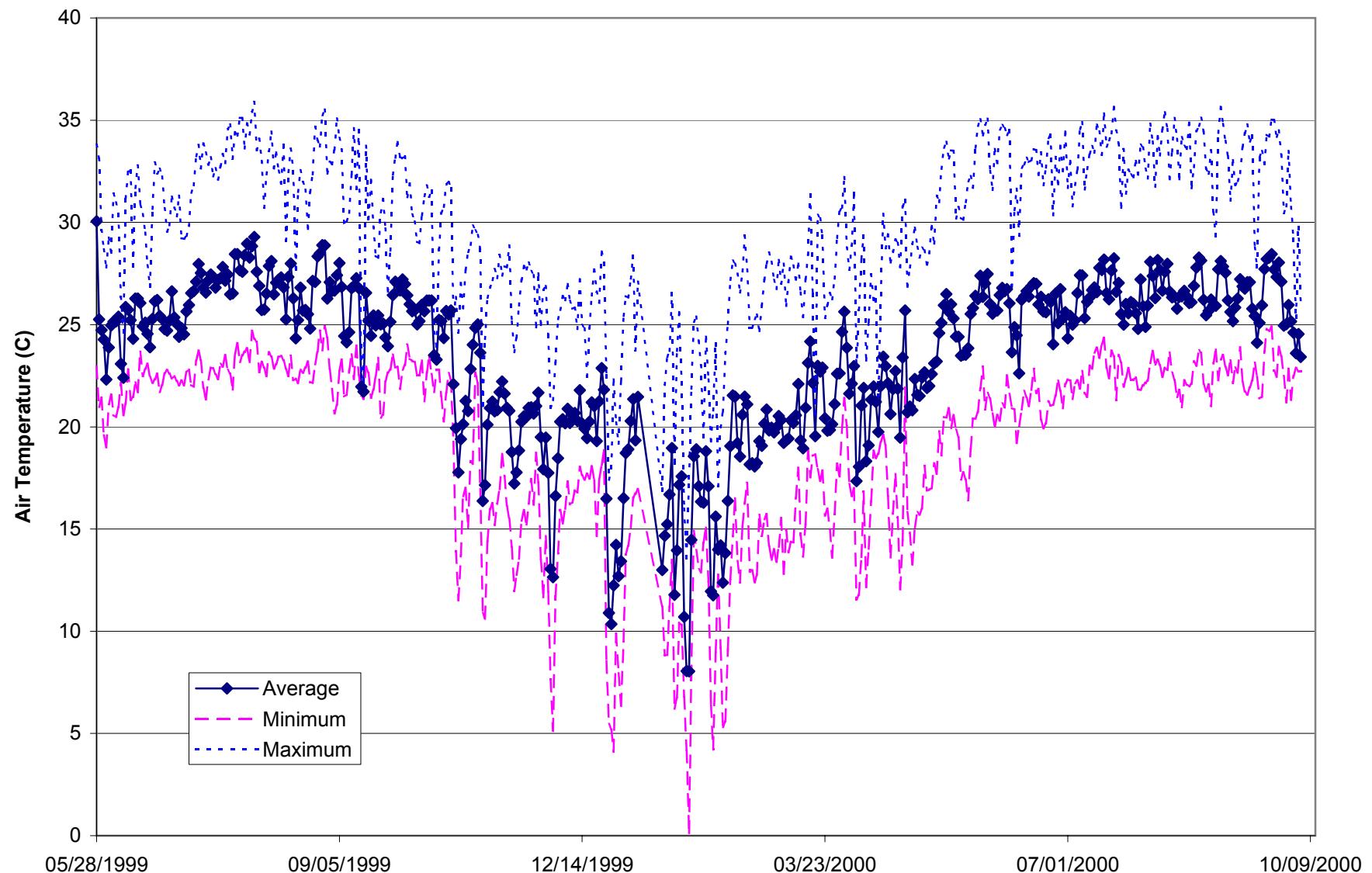
---

- Ann, Y., K.R. Reddy, and J.J. Delfino. 2000. Influence of chemical amendments on phosphorus immobilization in soils from a constructed wetland. *Ecological Engineering* 14:157-167. 2000.
- CH2M HILL. August 2000. *PSTA Research and Demonstration Project Phase 1 Summary Report*. February 1999 to March 2000. August 2000.
- CH2M HILL. February 2000. *Periphyton-Based Stormwater Treatment Area (PSTA) Research and Demonstration Project PSTA Research Plan*. February 2000.
- Doren, R.F. and R.D. Jones. 1996. Conceptual Design of Periphyton-Based STAs. Memo to Col. T. Rice, COE dated January 30, 1996.
- Kadlec, R.H. 1998. Unpublished.
- Kadlec, R.H. 1996. Algal STAs for Achieving Phase II Everglades Protection. Technology Outline., Letter Report dated October 21, 1996. 9 pp.
- Kadlec, R.H. 1996. Frog Pond Pilot Project. Periphyton STA for Treating Runoff in the C-111 Area. Letter report dated November 28, 1996. 12 pp.
- Kadlec, R.H. and W.W. Walker. 1996. Perspectives on the Periphyton STA Idea. Draft letter report dated December 26, 1996. 26 pp.

**APPENDIX A**

## **Meteorological Data**

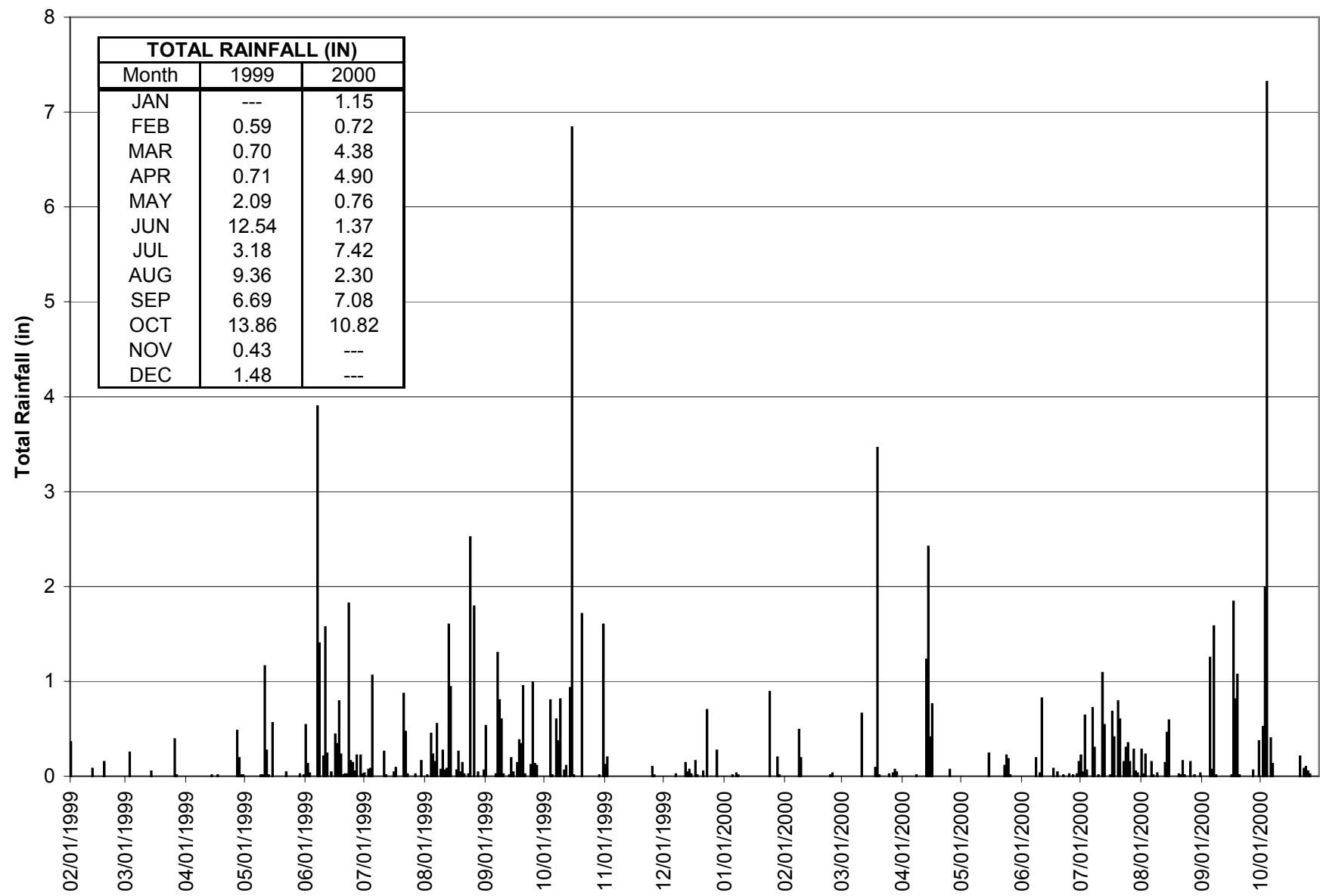
---



**EXHIBIT A-1**

Average Daily Air Temperature Data at the South ENR STRC

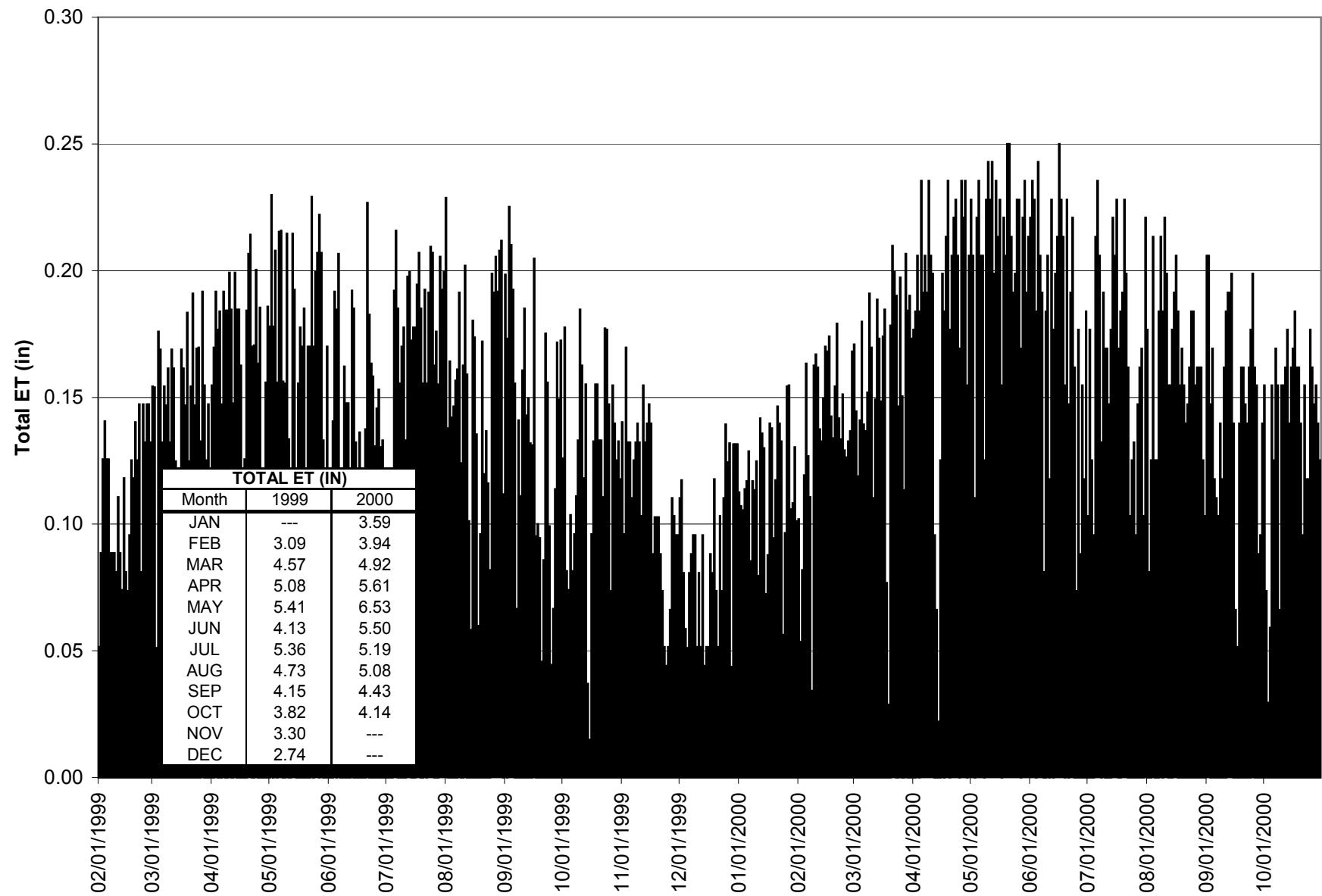
DFB/16428.xls



#### EXHIBIT A-2

Daily Rainfall Data at the ENR Rainfall Station ENR301

DFB/16428.xls



### EXHIBIT A-3

Daily Evaporation Data at the ENR Evapotranspiration Station ENRP

DFB/16428.xls

APPENDIX B

## **ENR PSTA Test Cells**

---

**Exhibit B-1**

Water Balances for the PSTA Test Cells, April 2000 - September 2000

Treatment	Cell	Month	Depth (m)	HLR (cm/d)	Inflow		Outflow		Rainfall		ET		ΔSTORAGE (m3)	Residual (m3)	Residual (% of inflow)
					(m3/d)	(m3)	(m3/d)	(m3)	(in)	(m3)	(mm)	(m3)			
4	13	Apr-00	0.147	5.18	121.930	3,779.84	78.364	2,429.29	4.90	287.74	142.60	329.68	422.099	886.51	21.79
		May-00	0.250	5.14	121.905	3,779.05	106.876	3,313.17	0.76	45.66	165.76	392.06	108.137	11.34	0.30
		Jun-00	0.282	5.10	121.816	3,776.30	116.023	3,596.70	1.37	83.02	139.80	333.53	3.272	-74.18	-1.92
		Jul-00	0.283	5.11	121.929	3,779.79	91.577	2,838.89	7.42	450.02	131.78	314.66	-14.920	1091.18	25.80
		Aug-00	0.289	5.08	121.886	3,778.45	93.417	2,895.92	2.30	139.68	129.00	308.43	46.640	667.14	17.03
		Sep-00	0.325	5.25	121.991	3,781.72	108.241	3,355.48	7.08	434.13	112.51	271.61	40.470	548.29	13.01
5	8	Apr-00	0.263	5.19	123.190	3,818.89	146.430	4,539.32	4.90	295.94	142.60	339.07	-66.134	-697.43	-16.95
		May-00	0.242	5.19	123.165	3,818.10	142.513	4,417.91	0.76	45.62	165.76	391.72	111.646	-1057.56	-27.37
		Jun-00	0.284	5.14	123.077	3,815.39	126.807	3,931.01	1.37	83.19	139.80	334.23	19.311	-385.98	-9.90
		Jul-00	0.303	5.20	123.188	3,818.84	161.192	4,996.95	7.42	453.14	131.78	316.85	9.710	-1051.52	-24.61
		Aug-00	0.295	5.22	123.146	3,817.52	149.083	4,621.57	2.30	140.08	129.00	309.33	-10.963	-962.33	-24.32
		Sep-00	0.308	5.31	123.250	3,820.75	173.885	5,390.42	7.08	432.84	112.51	270.80	17.974	-1425.60	-33.52
6	3	Apr-00	0.101	--	0	0	6.778	210.11	4.90	284.00	142.60	325.39	-42.252	-209.25	-73.68
		May-00	0.147	5.75	54.604	1,692.72	16.197	502.12	0.76	44.68	165.76	383.67	564.394	287.22	16.53
		Jun-00	0.371	10.39	221.248	6,858.68	262.041	8,123.26	1.37	85.78	139.80	344.63	172.068	-1695.50	-24.42
		Jul-00	0.440	10.18	258.041	7,999.26	348.906	10,816.10	7.42	471.76	131.78	329.86	257.880	-2932.82	-34.62
		Aug-00	0.569	9.94	257.948	7,996.38	327.421	10,150.04	2.30	151.61	129.00	334.79	74.357	-2411.19	-29.59
		Sep-00	0.478	1.08	103.167	3,198.17	163.236	5,060.33	7.08	459.07	112.51	287.21	-720.115	-970.19	-26.53

**Exhibit B-2**

Monthly Averages of Field Measurements Collected from the ENR South Head Cell and the PSTA Test Cells, April 2000 - September 2000

Parameter	Month	Head Cell	Treatment		
			4 (Peat- Ca amended)	5 (Shellrock)	6 (Shellrock - Variable Stage)
Water Temp (°C)	Apr-00	24.68	26.09	25.21	21.74
	May-00	27.19	28.46	27.23	26.12
	Jun-00	28.57	29.87	28.91	30.24
	Jul-00	28.97	29.38	28.91	30.88
	Aug-00	28.87	28.21	28.13	29.70
	Sep-00	28.09	26.92	28.52	28.15
pH (units)	Apr-00	7.56	7.85	8.01	7.26
	May-00	7.42	7.73	7.86	7.63
	Jun-00	7.39	8.67	7.85	7.79
	Jul-00	7.27	8.49	7.78	7.76
	Aug-00	7.29	7.64	7.28	7.69
	Sep-00	7.13	7.21	7.13	7.72
Conductivity (µmhos/cm)	Apr-00	1020	1117	980	775
	May-00	1152	1184	1167	1176
	Jun-00	1136	1011	1056	1162
	Jul-00	740	974	1021	1013
	Aug-00	20	1083	1201	1222
	Sep-00	1210	1086	1236	1083
Salinity (ppt)	Apr-00	--	0.59	0.51	--
	May-00	--	0.62	0.62	--
	Jun-00	--	0.53	0.55	0.61
	Jul-00	--	0.51	0.53	0.53
	Aug-00	--	0.57	0.63	0.64
	Sep-00	--	0.57	0.65	0.57
Total Dissolved Solids (g/L)	Apr-00	0.652	0.715	0.627	0.496
	May-00	0.737	0.758	0.747	0.752
	Jun-00	0.727	0.647	0.676	0.744
	Jul-00	0.704	0.623	0.653	0.648
	Aug-00	0.796	0.693	0.769	0.782
	Sep-00	0.772	0.695	0.791	0.693
Dissolved Oxygen Saturation (%)	Apr-00	62.6	22.2	110.1	6.3
	May-00	40.4	29.5	111.0	63.1
	Jun-00	13.5	119.3	91.7	107.3
	Jul-00	5.9	111.8	75.0	120.0
	Aug-00	7.3	45.8	40.7	122.8
	Sep-00	2.9	6.1	29.0	111.5
Dissolved Oxygen (mg/L)	Apr-00	5.14	1.69	8.89	0.55
	May-00	3.21	2.15	8.56	5.07
	Jun-00	1.04	9.77	6.91	7.97
	Jul-00	0.46	9.23	5.66	8.86
	Aug-00	0.56	3.48	3.11	9.25
	Sep-00	0.23	0.48	2.13	8.63

**Exhibit B-3**

Monthly Averages of Water Quality Data Collected at the ENR South Head Cell and PSTA Test Cells, April 2000 - September 2000

Parameter	Month	Treatment					
		4 (Peat- Ca amended)		5 (Shellrock)		6 (Shellrock-Variable Stage)	
		Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow
Total Phosphorus as P (mg/L)	Apr-00	0.019	0.102	0.021	0.012	--	--
	May-00	0.018	0.089	0.019	0.011	0.018	0.022
	Jun-00	0.042	0.027	0.042	0.018	0.042	0.021
	Jul-00	0.031	0.013	0.031	0.010	0.031	0.015
	Aug-00	0.022	0.013	0.021	0.010	0.021	0.010
	Sep-00	0.024	0.020	0.024	0.015	0.024	0.012
Total Particulate Phosphorus (mg/L)	Apr-00	0.005	0.064	0.006	0.003	--	--
	May-00	0.005	0.044	0.007	0.003	0.005	0.017
	Jun-00	0.023	0.010	0.023	0.007	0.023	0.008
	Jul-00	0.020	0.002	0.020	0.004	0.020	0.005
	Aug-00	0.009	0.006	0.007	0.005	0.008	0.004
	Sep-00	0.013	0.010	0.013	0.007	0.014	0.004
Total Dissolved Phosphorus (mg/L)	Apr-00	0.014	0.038	0.015	0.010	--	--
	May-00	0.012	0.045	0.012	0.008	0.013	0.005
	Jun-00	0.019	0.017	0.019	0.011	0.019	0.013
	Jul-00	0.012	0.012	0.012	0.007	0.012	0.010
	Aug-00	0.024	0.007	0.025	0.006	0.024	0.007
	Sep-00	0.011	0.011	0.011	0.008	0.011	0.008
Dissolved Reactive Phosphorus (mg/L)	Apr-00	0.005	--	0.004	--	--	--
	May-00	0.004	0.005	0.003	--	0.004	--
	Jun-00	--	--	--	--	--	--
	Jul-00	--	--	--	--	--	--
	Aug-00	0.023	0.001	0.022	0.002	0.022	0.001
	Sep-00	0.008	0.001	0.007	0.002	0.007	0.001
Dissolved Organic Phosphorus (mg/L)	Apr-00	0.009	--	0.011	--	--	--
	May-00	0.008	0.026	0.009	--	0.009	--
	Jun-00	--	--	--	--	--	--
	Jul-00	--	--	--	--	--	--
	Aug-00	0.003	0.007	0.004	0.005	0.003	0.007
	Sep-00	0.005	0.011	0.005	0.007	0.005	0.006
Total Nitrogen, as N (mg/L)	Apr-00	1.60	3.46	1.60	1.94	--	--
	May-00	2.21	2.96	2.21	2.58	2.21	--
	Jun-00	3.55	3.28	3.48	3.22	3.61	3.12
	Jul-00	2.10	2.05	2.10	2.40	2.10	1.91
	Aug-00	2.41	2.26	2.41	2.58	2.41	2.36
	Sep-00	2.34	2.25	2.30	1.89	2.51	2.17
Total Kjeldahl Nitrogen, as N (mg/L)	Apr-00	1.58	3.46	1.58	1.94	--	--
	May-00	2.19	2.96	2.19	2.58	2.19	--
	Jun-00	3.52	3.28	3.45	3.22	3.57	3.12
	Jul-00	2.08	2.05	2.08	2.40	2.08	1.91
	Aug-00	2.41	2.24	2.41	2.58	2.41	2.36
	Sep-00	2.33	2.25	2.29	1.89	2.49	2.17
Nitrate/Nitrite, as N (mg/L)	Apr-00	0.02	0.00	0.02	0.00	--	--
	May-00	0.02	0.00	0.02	0.00	0.02	--
	Jun-00	0.03	0.00	0.03	0.00	0.04	0.00
	Jul-00	0.02	0.00	0.02	0.00	0.02	0.00
	Aug-00	0.00	0.02	0.00	0.00	0.00	0.00
	Sep-00	0.01	0.00	0.01	0.00	0.02	0.00

**Exhibit B-3**

Monthly Averages of Water Quality Data Collected at the ENR South Head Cell and PSTA Test Cells, April 2000 - September 2000

Parameter	Month	Treatment					
		4 (Peat- Ca amended)		5 (Shellrock)		6 (Shellrock-Variable Stage)	
		Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow
Ammonia, as NH <sub>3</sub> (mg/L)	Apr-00	0.02	0.11	0.02	0.02	--	--
	May-00	0.03	0.04	0.03	0.05	0.03	--
	Jun-00	0.17	0.01	0.17	0.00	0.17	0.01
	Jul-00	0.05	--	0.05	--	0.05	--
	Aug-00	0.04	--	0.04	--	0.04	--
	Sep-00	0.11	--	0.11	--	0.11	--
Organic Nitrogen (mg/L)	Apr-00	1.56	3.35	1.56	1.92	--	--
	May-00	2.16	2.92	2.16	2.54	2.16	--
	Jun-00	3.35	3.28	3.28	3.22	3.40	3.11
	Jul-00	2.03	--	2.03	--	2.03	--
	Aug-00	2.37	--	2.37	--	2.37	--
	Sep-00	2.22	--	2.18	--	2.38	--
TOC (mg/L)	Apr-00	44.00	54.00	38.58	41.00	--	--
	May-00	43.00	55.00	43.00	48.00	43.00	--
	Jun-00	45.00	42.00	46.00	45.00	45.00	44.00
	Jul-00	33.00	34.00	33.00	38.00	33.00	35.00
	Aug-00	42.00	44.00	42.00	43.50	42.00	42.00
	Sep-00	48.00	41.00	47.00	39.50	47.00	42.00
TSS (mg/L)	Apr-00	1.00	9.30	2.25	1.40	--	--
	May-00	3.00	4.00	3.00	7.00	3.00	--
	Jun-00	2.00	3.00	1.00	2.00	1.00	1.00
	Jul-00	1.00	2.00	1.00	4.00	1.00	1.00
	Aug-00	2.00	6.00	2.00	5.50	2.00	2.00
	Sep-00	--	--	--	--	--	--
Calcium (mg/L)	Apr-00	70.60	58.00	68.78	44.00	--	--
	May-00	62.60	51.90	62.60	44.80	62.60	--
	Jun-00	48.60	18.00	52.30	43.30	50.20	48.70
	Jul-00	70.60	22.80	70.60	48.80	70.60	64.20
	Aug-00	87.70	35.40	87.70	65.05	87.70	80.20
	Sep-00	--	--	--	--	--	--
Alkalinity (mg/L)	Apr-00	248.00	220.00	244.00	180.00	--	--
	May-00	230.00	204.00	230.00	192.00	230.00	--
	Jun-00	224.00	112.00	220.00	204.00	224.00	228.00
	Jul-00	232.00	100.00	232.00	180.00	232.00	220.00
	Aug-00	296.00	158.00	296.00	246.00	296.00	274.00
	Sep-00	--	--	--	--	--	--

**Notes:**

One-half the method detection limit used in the calculation of monthly averages for undetected values.

<sup>a</sup>Inflow averages include data from constant head cell outlet and samples collected from individual cell inlets.

**Exhibit B-4**

Monthly Summaries Total Phosphorus Mass Balance Data from the ENR Test Cells, April 2000 - September 2000

Treatment	Cell	Date	TP (mg/L)		Inflow (m <sup>3</sup> /d)	Outflow (m <sup>3</sup> /d)	Avg_flow (m <sup>3</sup> /d)	q_in (cm/d)	MB_TP (g/m <sup>2</sup> /y)		Removal		Calc_k (m/y)
			Inflow	Outflow					Inflow	Outflow	(g/m <sup>2</sup> /y)	(%)	
<b>Monthly</b> 4	13	Apr-00	0.019	0.102	121.98	65.61	93.79	5.18	0.359	1.037	-0.678	-188.76	-24.42
		May-00	0.018	0.089	121.90	112.22	117.06	5.15	0.331	1.431	-1.100	-332.59	-29.17
		Jun-00	0.042	0.027	121.78	96.67	109.22	5.11	0.772	0.392	0.380	49.25	7.39
		Jul-00	0.031	0.013	121.91	92.52	107.22	5.11	0.578	0.173	0.405	70.11	14.09
		Aug-00	0.022	0.013	121.90	104.98	117.67	5.10	0.405	0.231	0.173	42.88	8.90
		Sep-00	0.024	0.020	122.00	101.89	111.94	5.15	0.453	0.323	0.131	28.80	2.82
5	8	Apr-00	0.021	0.012	123.19	146.43	134.81	5.18	0.388	0.276	0.111	28.74	10.65
		May-00	0.019	0.011	123.16	139.48	131.32	5.21	0.357	0.247	0.110	30.81	10.14
		Jun-00	0.042	0.018	123.04	126.75	124.89	5.14	0.778	0.348	0.430	55.28	15.57
		Jul-00	0.031	0.010	123.17	157.91	140.54	5.12	0.575	0.249	0.325	56.60	23.70
		Aug-00	0.021	0.010	123.16	146.71	129.05	5.32	0.408	0.218	0.191	46.72	14.58
		Sep-00	0.024	0.015	123.26	175.26	149.26	5.21	0.454	0.388	0.066	14.52	11.14
6	3	Apr-00	--	--	--	--	--	--	--	--	--	--	--
		May-00	0.018	0.022	120.91	68.71	94.81	5.03	0.321	0.453	-0.132	-41.01	-3.28
		Jun-00	0.042	0.021	257.72	311.87	284.80	10.41	1.573	0.973	0.600	38.17	28.59
		Jul-00	0.031	0.015	258.01	344.08	301.05	10.26	1.149	0.751	0.398	34.64	32.48
		Aug-00	0.021	0.010	257.97	318.23	273.05	9.93	0.762	0.414	0.348	45.67	27.53
		Sep-00	0.024	0.012	92.12	194.78	143.45	3.58	0.310	0.315	-0.005	-1.77	14.88

**Exhibit B-5**

Period-of-Record, Quarterly, and Monthly Summaries of Total Nitrogen Mass Balance Data from the ENR Test Cells, April 2000 - September 2000

Treatment	Cell	Date	TN (mg/L)		Inflow (m <sup>3</sup> /d)	Outflow (m <sup>3</sup> /d)	Avg_flow (m <sup>3</sup> /d)	q_in (cm/d)	MB_TN (g/m <sup>2</sup> /y)		Removal		Calc_k (m/y)
			Inflow	Outflow					Inflow	Outflow	(g/m <sup>2</sup> /y)	(%)	
<b>Monthly</b>													
4	13	Apr-00	1.60	3.46	121.98	65.61	93.79	5.18	30.24	35.17	-4.93	-16.32	-11.21
		May-00	2.21	2.96	121.85	135.85	128.85	5.14	41.42	61.86	-20.44	-49.33	-5.79
		Jun-00	3.55	3.28	121.56	104.62	113.09	5.10	66.03	52.51	13.52	20.48	1.37
		Jul-00	2.10	2.05	121.94	64.04	92.99	5.11	39.15	20.07	19.08	48.74	0.34
		Aug-00	2.41	2.26	121.85	128.07	124.96	5.09	44.82	44.17	0.64	1.44	1.23
		Sep-00	2.34	2.25	122.23	138.45	130.34	5.03	43.00	46.83	-3.83	-8.91	0.77
5	8	Apr-00	1.60	1.94	123.24	168.51	145.87	5.22	30.47	50.51	-20.04	-65.79	-4.34
		May-00	2.21	2.58	123.11	151.39	137.25	5.20	41.93	60.20	-18.27	-43.57	-3.27
		Jun-00	3.48	3.22	122.82	126.57	124.70	5.13	65.17	62.14	3.03	4.65	1.48
		Jul-00	2.10	2.40	123.20	168.51	145.85	5.12	39.25	61.36	-22.11	-56.32	-2.95
		Aug-00	2.41	2.58	123.11	142.03	132.57	5.50	48.35	59.59	-11.25	-23.26	-1.43
		Sep-00	2.30	1.89	123.49	183.97	153.73	5.11	42.86	52.47	-9.61	-22.42	4.55
6	3	Apr-00	--	--	--	--	--	--	--	--	--	--	--
		May-00	2.21		120.89	0.00	60.45	5.09	41.07				
		Jun-00	3.61	3.12	257.24	324.79	291.02	10.38	136.73	149.20	-12.47	-9.12	6.25
		Jul-00	2.10	1.91	258.06	379.91	318.99	10.33	79.21	106.06	-26.85	-33.89	4.42
		Aug-00	2.41	2.36	257.88	311.66	284.77	9.98	87.79	103.89	-16.11	-18.35	0.84
		Sep-00	2.51	2.17	0.00	85.61	42.81	0.00	0.00	27.71	-27.71		0.95

**Exhibit B-6**

Monthly Summaries of Sediment Data from the ENR Test Cells, April 2000 - September 2000

<b>Treatment<sup>a</sup></b>	<b>Cell</b>	<b>Date</b>	<b>Density (g/cm<sup>3</sup>)</b>	<b>Solids (%)</b>	<b>Bulk Den (g/cm<sup>3</sup>)</b>	<b>TP (mg/kg)</b>	<b>TIP (mg/kg)</b>	<b>TKN (mg/kg)</b>	<b>TOC (mg/kg)</b>
<b>Monthly</b>									
4	13	Apr-00	1.30	35.00	0.46	255.7	249.5	--	--
		May-00	0.64	44.20	0.28	226.7	215.1	--	--
		Jun-00	0.48	39.30	0.19	182.5	245.0	6800.0	145.5
		Jul-00	0.61	46.85	0.28	170.5	186.0	--	--
		Aug-00	0.64	38.90	0.25	413.0	159.5	--	--
		Sep-00	0.71	43.05	0.30	262.2	229.8	4745.0	190.0
5	8	Apr-00	2.00	75.00	1.50	808.9	872.5	--	--
		May-00	1.42	66.10	0.95	805.8	798.6	--	--
		Jun-00	1.63	84.35	1.38	794.0	803.0	141.0	59.5
		Jul-00	1.65	81.40	1.34	710.0	861.5	--	--
		Aug-00	1.62	49.70	0.81	593.5	620.0	--	--
		Sep-00	1.80	73.98	1.33	811.9	786.6	141.5	43.5
6	3	Apr-00	1.95	72.00	1.40	1023.3	1031.5	--	--
		May-00	1.76	78.80	1.39	912.5	943.1	--	--
		Jun-00	1.63	83.55	1.36	956.0	938.0	246.0	54.0
		Jul-00	1.73	83.20	1.44	814.0	845.5	--	--
		Aug-00	1.55	74.05	1.15	726.0	657.5	--	--
		Sep-00	1.71	74.30	1.27	953.6	915.2	131.5	49.0

**EXHIBIT B-7**

Non-Reactive Phosphorus Data Summary for PSTA Test Cell Sediments, April 2000 - September 2000

Treatment	Soil	Sampling Date	Moisture %	TP (mg/kg)	NaHCO <sub>3</sub> Pi (mg/kg)	NaHCO <sub>3</sub> TP (mg/kg)	Labile Po (mg/kg)	HClPi (mg/kg)	Alkali Hydrolyz Po (NaOH TP) (mg/kg)	Residual Po (mg/kg)
4	PE_limed	6/27/00	58.24	272.3	31.67	30.36	-1.31	199.4	-5.6	40.1
		9/19/00	61.17	237.6	17.16	24.25	7.09	150.3	-29.7	73.8
5	SR	6/27/00	19.00	824.6	3.50	4.28	0.77	742.0	-24.9	49.3
		9/19/00	20.01	752.8	3.16	2.87	-0.29	678.6	-14.3	43.4
6	SR	6/27/00	19.28	925.4	3.28	3.87	0.59	1075.2	-34.6	48.4
		9/19/00	19.91	979.4	2.58	3.62	1.03	990.0	-33.70	47.62

**Notes:**

Data from 6/00 represent composite samples collected from the 1/3 and 2/3 walkways within each Test Cell.

**Exhibit B-8**

Monthly Summaries of Algae and Macrophyte Percent Cover Estimates for the PSTA Test Cells, April 2000 - September 2000

Treatment <sup>a</sup>	Cell	Date	Blue-Green Algal Mat	Green Algal Mat	Emergent Macrophytes	Floating Aquatic Plants	Submerged Aquatic Plants	Algal Mat % Cover	Macrophyte % Cover	Total % Cover
<b>Monthly</b>										
4	13	Apr-00	0%	0%	1%	0%	0%	0%	1%	1%
		May-00	2%	0%	3%	0%	1%	2%	4%	6%
		Jun-00	1%	3%	5%	0%	54%	4%	59%	63%
		Jul-00	1%	0%	11%	0%	97%	1%	107%	108%
		Aug-00	3%	0%	14%	0%	100%	3%	114%	117%
		Sep-00	3%	0%	18%	0%	97%	3%	115%	118%
5	8	Apr-00	11%	0%	18%	0%	69%	11%	87%	98%
		May-00	5%	0%	31%	0%	89%	5%	120%	125%
		Jun-00	8%	0%	14%	0%	53%	8%	67%	74%
		Jul-00	14%	0%	31%	0%	96%	14%	126%	141%
		Aug-00	6%	0%	48%	0%	97%	6%	145%	151%
		Sep-00	26%	0%	63%	0%	83%	26%	145%	171%
6	3	Apr-00	0%	0%	31%	0%	0%	0%	31%	31%
		May-00	0%	0%	24%	0%	0%	0%	24%	25%
		Jun-00	0%	0%	39%	0%	8%	0%	47%	47%
		Jul-00	1%	0%	53%	0%	61%	1%	113%	114%
		Aug-00	2%	0%	46%	0%	68%	2%	113%	116%
		Sep-00	11%	0%	69%	0%	63%	11%	132%	143%

## Exhibit B-9

Monthly Summaries of Periphyton Data from the ENR Test Cells, April 2000 - September 2000

Treatment	Cell	Date	Periphyton Biomass (g/m <sup>2</sup> )			Chl_a (corr) (mg/m <sup>2</sup> )	Pheno_a (mg/m <sup>2</sup> )	TP (g/m <sup>2</sup> )	TIP (g/m <sup>2</sup> )	TKN <sup>a</sup> (# cells/m <sup>2</sup> ) <sup>b</sup>	Blue Green Algae		Diatoms		Green Algae		Other Taxa		Total Taxa		Biovolume (cm <sup>3</sup> /m <sup>2</sup> )	Evenness	SWDI	
			Dry Wt	Ash Wt	AFDW						(# cells/m <sup>2</sup> ) <sup>b</sup> *10 <sup>6</sup>	(# taxa)	(# cells/m <sup>2</sup> ) <sup>b</sup> *10 <sup>6</sup>	(# taxa)	(# cells/m <sup>2</sup> ) <sup>b</sup> *10 <sup>6</sup>	(# taxa)	(# cells/m <sup>2</sup> ) <sup>b</sup> *10 <sup>6</sup>	(# taxa)						
Monthly 4	13	Apr-00	3484.2	2354.9	1129.2	565.9	142.8	19.3	2.067	1.234	--	55945.8	9.0	5361.7	14.0	2077.4	8.0	0.0	0.0	63384.9	31.0	34.07	0.681	3.37
		May-00	821.2	607.1	214.0	216.5	177.6	7.6	0.525	0.176	--	297348.1	12.0	7057.8	7.5	9182.5	1.0	0.0	0.0	313753.9	27.5	47.87	0.704	3.36
		Jun-00	1399.2	961.0	438.2	355.0	396.5	113.4	0.800	0.436	10.97	94780.3	9.0	2256.0	6.0	3754.3	4.5	0.0	0.0	100790.6	19.5	14.40	0.638	2.73
		Jul-00	199.4	138.6	60.8	16.3	33.8	5.8	0.169	0.080	--	58927.9	14.5	48963.3	19.0	819.5	6.0	0.0	0.0	59890.1	23.0	1.93	0.633	2.86
		Aug-00	708.4	494.0	214.3	213.8	172.5	91.8	0.363	0.210	--	41722.7	7.5	1185.7	7.0	639.8	3.0	0.0	0.0	43548.3	17.5	15.09	0.562	2.33
		Sep-00	303.3	194.6	108.7	52.5	126.4	13.9	0.217	0.038	4.39	150799.2	14.0	194.1	1.0	944.1	3.0	0.0	0.0	151937.5	18.0	9.99	0.704	2.90
5 <sup>b</sup>	8	Apr-00	578.8	427.8	151.0	124.9	172.5	0.0	0.365	0.043	--	431530.2	10.5	19515.1	7.5	1573.8	2.0	0.0	0.0	452619.1	20.0	22.57	0.702	3.03
		May-00	476.2	333.1	143.1	89.1	197.7	22.8	0.157	0.062	--	255802.2	13.0	12194.8	10.5	1439.2	2.5	0.0	0.0	269436.1	26.0	17.31	0.615	2.89
		Jun-00	238.9	164.7	74.2	65.6	152.5	1.3	0.076	0.044	2.34	132637.4	19.0	3415.4	10.5	2792.9	6.0	0.0	0.0	138845.6	35.5	27.46	0.716	3.68
		Jul-00	147.7	102.1	45.6	155.0	281.5	5.4	0.038	0.026	--	--	--	--	--	--	--	--	--	--	--	--	--	
		Aug-00	327.1	231.3	95.8	77.3	128.9	27.0	0.137	0.027	--	--	--	--	--	--	--	--	--	--	--	--	--	
		Sep-00	273.3	173.9	99.5	65.6	247.4	41.6	0.166	0.023	4.44	170662.2	15.0	988.2	6.0	816.6	5.0	0.0	0.0	172466.9	26.0	21.58	0.713	3.34
6	3	Apr-00	328.1	220.0	108.1	57.2	63.6	0.0	0.242	0.012	--	525711.1	13.0	4023.1	4.5	5331.2	1.5	0.0	0.0	535065.4	19.0	10.44	0.770	3.27
		May-00	215.3	147.1	95.2	70.3	66.4	2.8	0.257	0.079	--	72117.0	10.5	2362.3	8.0	1806.5	4.0	0.0	0.0	76285.8	22.5	8.75	0.610	2.76
		Jun-00	407.5	301.6	106.0	202.2	115.7	16.4	0.731	0.459	5.47	111945.6	14.5	869.6	3.5	2010.1	3.5	0.0	0.0	114825.4	21.5	2.64	0.732	3.24
		Jul-00	195.9	144.5	51.5	124.9	142.0	5.6	0.244	0.103	--	294416.6	14.0	152162.4	14.5	3636.5	5.0	0.0	0.0	301189.0	24.0	15.16	0.619	2.84
		Aug-00	216.6	159.2	57.3	66.2	92.7	37.6	0.149	0.103	--	223010.4	12.5	1029.9	2.0	436.7	1.0	0.0	0.0	224477.1	15.5	6.08	0.773	3.06
		Sep-00	275.0	174.8	100.2	59.8	155.9	20.0	0.166	0.023	3.84	389149.9	15.0	3046.5	7.5	10529.5	7.0	0.0	0.0	402725.9	29.5	28.34	0.620	3.02

## Notes:

SWDI = Shannon-Weaver Diversity Index

<sup>a</sup> TKN analyzed on a quarterly basis.<sup>b</sup> Periphyton taxonomy conducted on a quarterly basis for STC-5 beginning in July 2000.

**EXHIBIT B-10**

Non-Reactive Phosphorus Data Summary for PSTA Test Cell Periphyton, April 1999 - September 2000

Treatment	Soil	Sampling Date	Moisture %	TP mg/kg	NaHCO <sub>3</sub> Pi mg/kg	NaHCO <sub>3</sub> TP mg/kg	Labile Po mg/kg	HClPi mg/kg	Alkali Hydrolyz Po (NaOH TP) mg/kg	Residual Po mg/kg
4	PE_limed	06/27/2000	--	--	--	--	--	--	--	--
		09/20/2000	94.3	447.6	5.19	227.03	221.83	132.1	46.6	92.1
5	SR	06/27/2000	95.4	278.4	2.55	173.62	171.08	106.2	15.5	25.4
		09/20/2000	93.4	230.6	2.13	133.93	131.80	37.4	29.6	36.7
6	SR	06/27/2000	85.0	511.2	1.72	129.63	127.90	306.3	23.7	95.5
		09/20/2000	95.3	528.8	2.18	256.09	253.91	304.9	37.2	112.4

## EXHIBIT B-11

ENR PSTA Test Cell Average Algal Cell Counts (# cells/m<sup>2</sup> x 10<sup>6</sup>), April 2000 - September 2000

Organism Code	Division Code	Organism	Treatment		
			4	5	6
ANAB CIR	1	ANABAENOPSIS CIRCULARIS	--	--	--
APH DEL	1	APHANOcapsa DELICATISSIMA	25,170	5,247	9,527
APH GRE	1	APHANOcapsa GREVILLEI	--	--	--
APH INC	1	APHANOcapsa INCERTA	--	--	25,613
APH NUB	1	APHANOcapsa NUBLUM	83,599	--	--
APH PLA	1	APHANOcapsa PLANCTONICA?	3,451	--	11,580
APHA CLA	1	APHANOthece CLATHRATA	--	--	2,631
APHA SMI	1	APHANOthece SMITHII	10,590	4,718	17,146
APHA STA	1	APHANOthece STAGNINA	1,375	6,387	33,818
APHA VAR	1	APHANOthece VARIABILIS?	--	3,508	--
APHN FLO	1	APHANIZOMENON FLOS-AQUAE	--	6,666	9,494
ART TEN	1	ARTHROPIRA TENUIS?	--	--	--
CAL EPI	1	CALOTHRIX EPIPHYTICA	926	--	--
CHR DIS	1	CHROOCOCCUS DISPERSUS	1,374	3,938	8,063
CHR MIN	1	CHROOCOCCUS MINUTUS	389	1,577	2,971
CHR MINI	1	CHROOCOCCUS MINIMUS	2,426	5,641	17,582
CHR PLA	1	CHROOCOCCUS PLANCTONICUS	--	--	--
CHR TUR	1	CHROOCOCCUS TURGIDUS	--	--	463
COE KUE	1	COELOSPHAERIUM KUETZINGIANUM	--	--	--
CYL STA	1	CYLINDROSPERMUM STAGNALE	6,474	--	--
EUC MIN	1	EUCAPSIS MINOR	--	--	--
G ANA	1	ANABAENA SP	246	--	10,113
G CYL	1	CYLINDROSPERMUM SP	794	11,249	13,807
G GLO	1	GLOECAPSa SP	377	13,732	2,581
G LYN SM	1	LYNGBYA SP (SMALL)	18,344	--	22,449
G OSC ME	1	OSCILLATORIA SP (MEDIUM)	--	--	--
G OSC SM	1	OSCILLATORIA SP (SMALL)	6,246	4,640	11,662
G SCY	1	SCYTONEMA SP?	10,261	3,313	4,294
G SYNE	1	SYNECHOCOCCUS SP	95	27,154	35,466
GLO MEM	1	GLOEOthece MEMBRANACEAE	--	--	--
GOM APO	1	GOMPHOSPHAERIA APOINA	--	--	2,380
JOH PEL	1	JOHANNESBAPTISTIA PELLUCIDA	--	--	4,496
LYN AER	1	LYNGBYA AERUGINEO-CARULEA?	1,878	5,184	16,609
LYN AES	1	LYNGBYA AESTUARII	--	--	--
LYN CON	1	LYNGBYA CONTORTA	--	--	--
LYN EPI	1	LYNGBYA EPIPHYTICA	6,503	30,846	33,006
LYN LAG	1	LYNGBYA LAGERHEIMII	13,455	41,394	24,153
LYN LIM	1	LYNGBYA LIMNETICA	31,640	64,980	91,924
LYN PER	1	LYNGBYA PERELEGANS?	--	--	--
LYN TAY	1	LYNGBYA TAYLORII?	--	--	--
MER DUP	1	MERISMOPEDIA DUPLEX	--	--	--
MER GLA	1	MERISMOPEDIA GLAUDA	641	1,169	--
MER PUN	1	MERISMOPEDIA PUNCTATA	1,786	--	--
MER TEN	1	MERISMOPEDIA TENUISSIMA	4,985	296	3,216
MIC AER	1	MICROCYSTIS AERUGINOSA	1,283	--	--
MIC FIR	1	MICROCYSTIS FIRMA	17,956	6,525	10,404
MIC FLO	1	MICROCYSTIS FLOS-AQUAE	--	--	--
MIC SMI	1	MICROCYSTIS SMITHII	--	--	--
OSC AMP	1	OSCILLATORIA AMPHIBIA	740	6,628	7,495
OSC AMPH	1	OSCILLATORIA AMPHIGRANULATA	--	--	--
OSC ANG	1	OSCILLATORIA ANGUSTISSIMA	21,551	47,415	43,354
OSC FOR	1	OSCILLATORIA FORMOSA	12,697	14,357	5,986
OSC LIM	1	OSCILLATORIA LIMNETICA	11,834	41,580	18,297
OSC LIMO	1	OSCILLATORIA LIMOSA	--	--	--
OSC TEN	1	OSCILLATORIA TENUIS	4,258	--	--
OSC WIL	1	OSCILLATORIA WILLEI?	--	24,410	--
PHO LUC	1	PHORMIDIUM LUCIDUM?	--	--	--
PHO TEN	1	PHORMIDIUM TENUE	--	2,288	--
RHA LIN	1	RHABDODERMA LINEARE?	--	3,147	--
SCH ARE	1	SCHIZOTHRIX ARENARIA?	26,310	40,651	12,492
SCY HOF	1	SCYTONEMA HOFMANII?	--	--	--
SNO LAC	1	SNOWELLA LACUSTRIS	--	--	--
SPI LAX	1	SPIRULINA LAXA	434	--	--
SPI MAJ	1	SPIRULINA MAJOR	--	--	--

## EXHIBIT B-11

ENR PSTA Test Cell Average Algal Cell Counts (# cells/m<sup>2</sup> x 10<sup>6</sup>), April 2000 - September 2000

Organism Code	Division Code	Organism	Treatment		
			4	5	6
SPI SUB	1	SPIRULINA SUBSALSA	--	2,158	449
ANK FAL	3	ANKISTRODESMUS FALCATUS	653	--	--
ANK NAN	3	ANKISTRODESMUS NANNOSELENE	416	--	--
ANK SPI	3	ANKISTRODESMUS SPIRALIS	354	130	437
CHA ENS	3	CHARACIUM ENSIFORME	331	--	--
CLO PAR	3	CLOSTERIUM PARVULUM	--	--	--
COE MIC	3	COELASTRUM MICROPORUM	--	--	422
COE SPH	3	COELASTRUM SPAERICUM	370	292	--
COS BOT	3	COSMARIUM BOTRYTIS	46	--	--
COS GRAN	3	COSMARIUM GRANATUM	214	--	--
COS PUN	3	COSMARIUM PUNCTULATUM	--	--	--
COS SUBR	3	COSMARIUM SUBRENIFORME	362	406	--
COS TUB	3	COSMOCLADIUM TUBURCULATUM	--	--	--
CRU API	3	CRUCIGENIA APICULATA	--	--	857
DIC PUL	3	DICTYOSPHAERIUM PULCHELLUM	--	--	--
ELA GEL	3	ELAKATOTHRIX GELATINOSA	--	--	--
EUA COR ME	3	EUASTRUM CORNUBIENSE V MEDIANUM	--	130	--
EUA VER	3	EUASTRUM VERRUCOSUM	--	--	--
G CHLA	3	CHLAMYDOMONAS SP	--	--	476
G COS	3	COSMARIUM SP	--	--	--
G GONA	3	GONATOZYGON SP	--	--	--
G MOU	3	MOUGEOTIA SP	--	895	1,265
G OED	3	OEDOGONIUM SP	1,122	74	--
G SPI	3	SPIROGYRA SP	194	74	--
G STAU	3	STAURA STRUM SP	158	--	--
GOL RAD	3	GOLENKINIA RADIATA	214	--	--
KIR CON	3	KIRCHNERIELLA CONTORTA	--	--	--
KIR LUN	3	KIRCHNERIELLA LUNARIS	321	--	--
KIR OBE	3	KIRCHNERIELLA OBESA	653	--	437
LAG SUB	3	LAGERHEIMIA SUBSALSA	--	--	--
MIC PIN	3	MICRASTERIAS PINNATIFIDA	--	--	--
OED PUN	3	OEDOGONIUM PUNCTATO STRIATUM	--	1,107	--
OOC PAR	3	OOCYSTIS PARVA	1,338	1,259	422
OOC SOL	3	OOCYSTIS SOLITARIA	172	--	340
PED BIR	3	PEDIASTRUM BIRADIATUM	2,647	--	--
PED OBT	3	PEDIASTRUM OBTUSUM	--	--	--
PED TET	3	PEDIASTRUM TETRAS	--	--	--
PED TET TE	3	PEDIASTRUM TETRAS V TETRAODON	1,021	--	1,687
SCE ACU	3	SCENEDESMUS ACUMINATUS	2,612	--	--
SCE ARM	3	SCENEDESMUS ARMATUS	--	--	943
SCE BIJ	3	SCENEDESMUS BIJUGA	897	314	1,150
SCE BIJ AL	3	SCENEDESMUS BIJUGA V ALTERNANS	2,612	--	4,407
SCE DEN	3	SCENEDESMUS DENTICULATUS	--	--	--
SCE DIM	3	SCENEDESMUS DIMORPHUS	--	--	658
SCE QUA	3	SCENEDESMUS QUADRICAUDA	511	--	736
SCE SUB	3	SCENEDESMUS SUBSPICATUS	--	--	--
SCH SET	3	SCHROEDERIA SETIGERA	--	--	--
SPH SCH	3	SPHAEROCYSTIS SCHROERTERI	195	1,044	4,070
SPO PLA	3	SPONDYLOSIMUM PLANUM	331	--	--
STAU HEX	3	STAURA STRUM HEXACERUM	--	--	--
STAU MAN	3	STAURA STRUM MANFELDTII	--	--	--
STAU PAR P	3	STAURA STRUM PARADOXUM V PARVULUM	--	--	--
STAU TET	3	STAURA STRUM TETRACERUM	--	630	--
TET MIN	3	TETRAEDRON MINIMUM	143	--	1,065
TET TRI	3	TETRAEDRON TRIGONUM	198	630	373
UN CHL FI	3	UNID CHLOROPHYCEAE FILAMENT BASAL CELLS	--	--	--
UN FIL CH	3	UNID FILAMENTOUS CHLOROPHYTA	204	877	2,826
ACH EXI	4	ACHNANTHES EXIGUA	--	--	--
ACHN MIN	4	ACHNANTHIDIUM MINUTISSIMUM	214	656	715
AMP LIN	4	AMPHORA LINEOLATA?	--	--	--
AMP OVA AF	4	AMPHORA OVALIS V AFFINIS	--	--	66
AMP PEL	4	AMPHIPLEURA PELLUCIDA	--	--	--
AMP VEN	4	AMPHORA VENETA	--	--	--
BRA VIT	4	BRACHYSIRA VITREA	--	--	--

## EXHIBIT B-11

ENR PSTA Test Cell Average Algal Cell Counts (# cells/m<sup>2</sup> x 10<sup>6</sup>), April 2000 - September 2000

Organism Code	Division Code	Organism	Treatment		
			4	5	6
COC PLA LI	4	COCCONEIS PLACENTULA V LINEATA	--	--	427
COS GRA	4	COSCINODISCUS GRANII	--	--	--
CYC MEN	4	CYCLOTELLA MENEGHINIANA	--	--	--
CYM MIC	4	CYMBELLA MICROCEPHALA	214	810	593
DIP ELL	4	DIPLONEIS ELLIPTICA	--	--	--
DIP FIN	4	DIPLONEIS FINNICA	--	--	--
DIP OBL	4	DIPLONEIS OBLONGELLA	--	630	--
DIP OVA	4	DIPLONEIS OVALIS	236	--	244
ENC EVE	4	ENCYONEMA EVERGLADIANUM	314	2,719	389
ENC MIN	4	ENCYONEMA MINUTUM	--	--	--
ENC SIL	4	ENCYONEMA SILESIACUM	--	--	--
ENC SIL EL	4	ENCYONEMA SILESIACUM V ELEGANS	1,306	1,095	614
EPI ADN	4	EPITHEMIA ADNATA	491	656	952
EUN PEC MI	4	EUNOTIA PECTINALIS V MINOR	--	--	--
FRA FAS	4	FRAGILARIA FASCICULATA?	--	2,518	878
FRA NAN	4	FRAGILARIA NANANA?	--	1,459	66
FRA SYN	4	FRAGILARIA SYNEGROTESCA	97	1,020	380
FRA ULN	4	FRAGILARIA ULNA	--	--	--
G AMP	4	AMPHORA SP	63	--	--
G NAV SM	4	NAVICULA SP (SMALL)	331	--	--
G NIT	4	NITZSCHIA SP	48	--	449
G NIT ME	4	NITZSCHIA SP (MEDIUM)	--	--	164
G NIT SM	4	NITZSCHIA SP (SMALL)	567	74	66
G STE	4	STEPHANODISCUS SP	--	--	--
GOM AFF IN	4	GOMPHONEMA AFFINE V INSIGNE	--	--	--
GOM GRA	4	GOMPHONEMA GRACILE	--	--	--
GOM INT VI	4	GOMPHONEMA INTRICATUM V VIBRIO	214	630	--
GOM PAR	4	GOMPHONEMA PARVULUM	63	--	293
GYR OBS	4	GYROSIGMA OBSCURUM?	--	--	--
MAS LANC	4	MASTOGLOIA LANCEOLATA	--	146	--
MAS SMI	4	MASTOGLOIA SMITHII	586	570	496
MAS SMI LA	4	MASTOGLOIA SMITHII V LACUSTRIS	197	1,570	276
NAV CRY	4	NAVICULA CRYPTOCEPHALA	573	--	381
NAV CRYP	4	NAVICULA CRYPTOTENELLA	641	308	682
NAV POD	4	NAVICULA PODZORSKII	63	--	--
NAV PUP RE	4	NAVICULA PUPULA V RECTANGULARIS	125	--	--
NAV RAD	4	NAVICULA RADIOSA	160	--	--
NAV RAD PA	4	NAVICULA RADIOSA V PARVA	--	--	--
NAV SUBR	4	NAVICULA SUBRHYNCHOCEPHALA	--	--	--
NIT ACI	4	NITZSCHIA ACICULARIS	--	--	--
NIT AMP	4	NITZSCHIA AMPHIBIA	512	--	--
NIT ANG	4	NITZSCHIA ANGUSTATA	--	--	--
NIT CON	4	NITZSCHIA CONSTRICTA	125	--	--
NIT FRU	4	NITZSCHIA FRUSTULUM	256	--	--
NIT NAN	4	NITZSCHIA NANA	--	--	--
NIT PAL	4	NITZSCHIA PALEA	662	--	66
NIT PALE	4	NITZSCHIA PALEACEA	358	416	--
NIT PALF	4	NITZSCHIA PALEAFORMIS	--	--	--
NIT SCA	4	NITZSCHIA SCALARIS	--	--	66
NIT SEM	4	NITZSCHIA SEMIROBUSTA	558	2,780	893
NIT SERP	4	NITZSCHIA SERPENTIRAPHE	97	138	422
PIN VIR	4	PINNULARIA VIRIDIS	--	--	--
PIN VIR MI	4	PINNULARIA VIRIDIS V MINOR	--	--	--
RHO GIBA	4	RHOPALODIA GIBBA	675	146	--
SYN ACU	4	SYNEDRA ACUS	--	--	--
OPH DES MI	7	OPHIOCYTIUM DESERTUM V MINOR	--	--	--
G EUG	10	EUGLENA SP	331	--	--
G CHI	11	CHILOMONAS SP	--	--	--
G CHRM	11	CHROOMONAS SP	--	--	--
G CRY	11	CRYPTOMONAS SP	--	--	--
G GYM SM	12	GYMNOBINIUM SP (SMALL)	--	--	--
PER INC	12	PERIDINIUM INCONSPICUUM	--	--	--
PER PUS	12	PERIDINIUM PUSILLUM	--	--	--

## EXHIBIT B-12

ENR PSTA Test Cell Average Algal Biovolume Data (cm<sup>3</sup>/m<sup>2</sup>), April 2000 - September 2000

Organism Code	Division Code	Organism	ENR South Test Cell PSTA Treatment		
			4	5	6
G ANA	1	ANABAENA SP	0.005	--	0.192
ANAB CIR	1	ANABAENOPSIS CIRCULARIS	--	--	--
APHN FLO	1	APHANIZOMENON FLOS-AQUAE	--	0.147	0.209
APH DEL	1	APHANOCAPSA DELICATISSIMA	0.025	0.005	0.010
APH GRE	1	APHANOCAPSA GREVILLEI	--	--	--
APH INC	1	APHANOCAPSA INCERTA	--	--	0.026
APH NUB	1	APHANOCAPSA NUBLUM	0.334	--	--
APH PLA	1	APHANOCAPSA PLANCTONICA?	0.028	--	0.093
APHA CLA	1	APHANOTHECE CLATHRATA	--	--	0.008
APHA SMI	1	APHANOTHECE SMITHII	0.064	0.028	0.103
APHA STA	1	APHANOTHECE STAGNINA	0.033	0.153	0.812
APHA VAR	1	APHANOTHECE VARIABILIS?	--	0.021	--
ART TEN	1	ARTHROSPIRA TENUIS?	--	--	--
CAL EPI	1	CALOTHRIX EPIPHYTICA	0.033	--	--
CHR DIS	1	CHROOCOCCUS DISPERSUS	0.019	0.055	0.113
CHR MINI	1	CHROOCOCCUS MINIMUS	0.010	0.023	0.070
CHR MIN	1	CHROOCOCCUS MINUTUS	0.004	0.017	0.033
CHR PLA	1	CHROOCOCCUS PLANCTONICUS	--	--	--
CHR TUR	1	CHROOCOCCUS TURGIDUS	--	--	0.124
COE KUE	1	COELOSPAERIUM KUETZINGIANUM	--	--	--
G CYL	1	CYLINDROSPERMUM SP	0.028	0.394	0.483
CYL STA	1	CYLINDROSPERMUM STAGNALE	0.511	--	--
EUC MIN	1	EUCAPSIS MINOR	--	--	--
G GLO	1	GLOEOPCAPSA SP	0.001	0.055	0.010
GLO MEM	1	GLOEOTHECE MEMBRANACEAE	--	--	--
GOM APO	1	GOMPHOSPHAERIA APOGINA	--	--	0.067
JOH PEL	1	JOHANNESBAPTISTIA PELLUCIDA	--	--	0.252
LYN AER	1	LYNGBYA AERUGINEO-CARULEA?	0.222	0.612	1.960
LYN AES	1	LYNGBYA AESTUARII	--	--	--
LYN CON	1	LYNGBYA CONTORTA	--	--	--
LYN EPI	1	LYNGBYA EPIPHYTICA	0.039	0.185	0.198
LYN LAG	1	LYNGBYA LAGERHEIMII	0.081	0.248	0.145
LYN LIM	1	LYNGBYA LIMNETICA	0.791	1.624	2.298
LYN PER	1	LYNGBYA PERELEGANS?	--	--	--
G LYN SM	1	LYNGBYA SP (SMALL)	0.092	--	0.112
LYN TAY	1	LYNGBYA TAYLORII?	--	--	--
MER DUP	1	MERISMOPEDIA DUPLEX	--	--	--
MER GLA	1	MERISMOPEDIA GLAUCA	0.009	0.016	--
MER PUN	1	MERISMOPEDIA PUNCTATA	0.005	--	--
MER TEN	1	MERISMOPEDIA TENUISSIMA	0.005	0.000	0.003
MIC AER	1	MICROCYSTIS AERUGINOSA	0.044	--	--
MIC FIR	1	MICROCYSTIS FIRMA	0.144	0.052	0.083
MIC FLO	1	MICROCYSTIS FLOS-AQUAE	--	--	--
MIC SMI	1	MICROCYSTIS SMITHII	--	--	--
OSC AMP	1	OSCILLATORIA AMPHIBIA	0.047	0.424	0.480
OSC AMPH	1	OSCILLATORIA AMPHIGRANULATA	--	--	--
OSC ANG	1	OSCILLATORIA ANGUSTISSIMA	0.043	0.095	0.087
OSC FOR	1	OSCILLATORIA FORMOSA	1.003	1.134	0.473
OSC LIM	1	OSCILLATORIA LIMNETICA	0.083	0.291	0.128
OSC LIMO	1	OSCILLATORIA LIMOSA	--	--	--
G OSC ME	1	OSCILLATORIA SP (MEDIUM)	--	--	--
G OSC SM	1	OSCILLATORIA SP (SMALL)	0.031	0.023	0.058
OSC TEN	1	OSCILLATORIA TENUIS	0.251	--	--
OSC WIL	1	OSCILLATORIA WILLEI?	--	0.513	--
PHO LUC	1	PHORMIDIUM LUCIDUM?	--	--	--
PHO TEN	1	PHORMIDIUM TENUE	--	0.057	--

## EXHIBIT B-12

ENR PSTA Test Cell Average Algal Biovolume Data (cm<sup>3</sup>/m<sup>2</sup>), April 2000 - September 2000

Organism Code	Division Code	Organism	ENR South Test Cell PSTA Treatment		
			4	5	6
RHA LIN	1	RHABDODERMA LINEARE?	--	0.142	--
SCH ARE	1	SCHIZOTHRIX ARENARIA?	0.342	0.528	0.162
SCY HOF	1	SCYTONEMA HOFMANII?	--	--	--
G SCY	1	SCYTONEMA SP?	14.212	4.589	5.948
SNO LAC	1	SNOWELLA LACUSTRIS	--	--	--
SPI LAX	1	SPIRULINA LAXA	0.055	--	--
SPI MAJ	1	SPIRULINA MAJOR	--	--	--
SPI SUB	1	SPIRULINA SUBSALSA	--	0.136	0.028
G SYNE	1	SYNECHOCOCCUS SP	0.006	1.738	2.270
ANK FAL	3	ANKISTRODESMUS FALCATUS	0.034	--	--
ANK NAN	3	ANKISTRODESMUS NANNOSELENE	0.002	--	--
ANK SPI	3	ANKISTRODESMUS SPIRALIS	0.004	0.002	0.005
CHA ENS	3	CHARACIUM ENSIFORME	0.023	--	--
G CHLA	3	CHLAMYDOMONAS SP	--	--	0.128
CLO PAR	3	CLOSTERIUM PARVULUM	--	--	--
COE MIC	3	COELASTRUM MICROPORUM	--	--	0.027
COE SPH	3	COELASTRUM SPAERICUM	0.029	0.023	--
COS BOT	3	COSMARIUM BOTRYTIS	1.226	--	--
COS GRAN	3	COSMARIUM GRANATUM	2.586	--	--
COS PUN	3	COSMARIUM PUNCTULATUM	--	--	--
G COS	3	COSMARIUM SP	--	--	--
COS SUBR	3	COSMARIUM SUBRENIFORME	0.095	0.106	--
COS TUB	3	COSMOCLADIUM TUBURCULATUM	--	--	--
CRU API	3	CRUCIGENIA APICULATA	--	--	0.022
DIC PUL	3	DICTYOSPHAERIUM PULCHELLUM	--	--	--
ELA GEL	3	ELAKATOTHRICE GELATINOSA	--	--	--
EUA COR ME	3	EUASTRUM CORNUBIENSE V MEDIANUM	--	0.344	--
EUA VER	3	EUASTRUM VERRUCOSUM	--	--	--
GOL RAD	3	GOLENKINIA RADIATA	0.024	--	--
G GONA	3	GONATOZYGON SP	--	--	--
KIR CON	3	KIRCHNERIELLA CONTORTA	--	--	--
KIR LUN	3	KIRCHNERIELLA LUNARIS	0.004	--	--
KIR OBE	3	KIRCHNERIELLA OBESA	0.006	--	0.004
LAG SUB	3	LAGERHEIMIA SUBSALSA	--	--	--
MIC PIN	3	MICRASTERIAS PINNATIFIDA	--	--	--
G MOU	3	MOUGEOTIA SP	--	0.337	0.477
OED PUN	3	OEDOGONIUM PUNCTATOSTRIATUM	--	8.890	--
G OED	3	OEDOGONIUM SP	2.257	0.149	--
OOC PAR	3	OOCYSTIS PARVA	0.033	0.031	0.010
OOC SOL	3	OOCYSTIS SOLITARIA	0.233	--	0.461
PED BIR	3	PEDIASTRUM BIRADIATUM	0.357	--	--
PED OBT	3	PEDIASTRUM OBTUSUM	--	--	--
PED TET	3	PEDIASTRUM TETRAS	--	--	--
PED TET TE	3	PEDIASTRUM TETRAS V TETRAODON	0.086	--	0.142
SCE ACU	3	SCENEDESMUS ACUMINATUS	0.070	--	--
SCE ARM	3	SCENEDESMUS ARMATUS	--	--	0.063
SCE BIJ	3	SCENEDESMUS BIJUGA	0.009	0.003	0.011
SCE BIJ AL	3	SCENEDESMUS BIJUGA V ALTERNANS	0.084	--	0.141
SCE DEN	3	SCENEDESMUS DENTICULATUS	--	--	--
SCE DIM	3	SCENEDESMUS DIMORPHUS	--	--	0.016
SCE QUA	3	SCENEDESMUS QUADRICAUDA	0.052	--	0.075
SCE SUB	3	SCENEDESMUS SUBSPICATUS	--	--	--
SCH SET	3	SCHROEDERIA SETIGERA	--	--	--
SPH SCH	3	SPHAEROCYSTIS SCHROERTERI	0.022	0.118	0.460
G SPI	3	SPIROGYRA SP	17.437	6.668	--
SPO PLA	3	SPONDYLOSIMUM PLANUM	0.019	--	--

## EXHIBIT B-12

ENR PSTA Test Cell Average Algal Biovolume Data (cm<sup>3</sup>/m<sup>2</sup>), April 2000 - September 2000

Organism Code	Division Code	Organism	ENR South Test Cell PSTA Treatment		
			4	5	6
STAU HEX	3	STAURASTRUM HEXACERUM	--	--	--
STAU MAN	3	STAURASTRUM MANFELDTII	--	--	--
STAU PAR P	3	STAURASTRUM PARADOXUM V PARVULUM	--	--	--
G STAU	3	STAURASTRUM SP	0.209	--	--
STAU TET	3	STAURASTRUM TETRACERUM	--	0.036	--
TET MIN	3	TETRAEDRON MINIMUM	0.007	--	0.049
TET TRI	3	TETRAEDRON TRIGONUM	0.192	0.613	0.363
UN CHL FI	3	UNID CHLOROPHYCEAE FILAMENT BASAL CELLS	--	--	--
UN FIL CH	3	UNID FILAMENTOUS CHLOROPHYTA	0.173	0.744	2.397
ACH EXI	4	ACHNANTHES EXIGUA	--	--	--
ACHN MIN	4	ACHNANTHIDIUM MINUTISSIMUM	0.030	0.092	0.100
AMP PEL	4	AMPHIPLEURA PELLUCIDA	--	--	--
AMP LIN	4	AMPHORA LINEOLATA?	--	--	--
AMP OVA AF	4	AMPHORA OVALIS V AFFINIS	--	--	0.106
G AMP	4	AMPHORA SP	0.024	--	--
AMP VEN	4	AMPHORA VENETA	--	--	--
BRA VIT	4	BRACHYSIRA VITREA	--	--	--
COCC PLA LI	4	COCCONEIS PLACENTULA V LINEATA	--	--	0.502
COS GRA	4	COSCINODISCUS GRANII	--	--	--
CYC MEN	4	CYCLOTELLA MENEGHINIANA	--	--	--
CYM MIC	4	CYMBELLA MICROCEPHALA	0.037	0.138	0.101
DIP ELL	4	DIPLONEIS ELLIPTICA	--	--	--
DIP FIN	4	DIPLONEIS FINNICA	--	--	--
DIP OBL	4	DIPLONEIS OBLONGELLA	--	0.212	--
DIP OVA	4	DIPLONEIS OVALIS	0.095	--	0.098
ENC EVE	4	ENCYONEMA EVERGLADIANUM	0.059	0.511	0.073
ENC MIN	4	ENCYONEMA MINUTUM	--	--	--
ENC SIL	4	ENCYONEMA SILESIACUM	--	--	--
ENC SIL EL	4	ENCYONEMA SILESIACUM V ELEGANS	1.575	1.321	0.740
EPI ADN	4	EPITHEMIA ADNATA	4.128	5.516	8.002
EUN PEC MI	4	EUNOTIA PECTINALIS V MINOR	--	--	--
FRA FAS	4	FRAGILARIA FASCICULATA?	--	4.653	1.623
FRA NAN	4	FRAGILARIA NANANA?	--	0.550	0.025
FRA SYN	4	FRAGILARIA SYNEGROTESCA	0.104	1.093	0.408
FRA ULN	4	FRAGILARIA ULNA	--	--	--
GOM AFF IN	4	GOMPHONEMA AFFINE V INSIGNE	--	--	--
GOM GRA	4	GOMPHONEMA GRACILE	--	--	--
GOM INT VI	4	GOMPHONEMA INTRICATUM V VIBRIO	0.468	1.375	--
GOM PAR	4	GOMPHONEMA PARVULUM	0.112	--	0.523
GYR OBS	4	GYROSIGMA OBSCURUM?	--	--	--
MAS LANC	4	MASTOGLOIA LANCEOLATA	--	0.981	--
MAS SMI	4	MASTOGLOIA SMITHII	2.037	1.981	1.727
MAS SMI LA	4	MASTOGLOIA SMITHII V LACUSTRIS	0.316	2.525	0.444
NAV CRY	4	NAVICULA CRYPTOCEPHALA	0.243	--	0.161
NAV CRYP	4	NAVICULA CRYPTOTENELLA	0.476	0.228	0.506
NAV POD	4	NAVICULA PODZORSKII	0.138	--	--
NAV PUP RE	4	NAVICULA PUPULA V RECTANGULARIS	0.113	--	--
NAV RAD	4	NAVICULA RADIOSA	0.658	--	--
NAV RAD PA	4	NAVICULA RADIOSA V PARVA	--	--	--
G NAV SM	4	NAVICULA SP (SMALL)	0.156	--	--
NAV SUBR	4	NAVICULA SUBRHYNCHOCEPHALA	--	--	--
NIT ACI	4	NITZSCHIA ACICULARIS	--	--	--
NIT AMP	4	NITZSCHIA AMPHIBIA	0.123	--	--
NIT ANG	4	NITZSCHIA ANGUSTATA	--	--	--
NIT CON	4	NITZSCHIA CONSTRICTA	0.076	--	--
NIT FRU	4	NITZSCHIA FRUSTULUM	0.058	--	--

## EXHIBIT B-12

ENR PSTA Test Cell Average Algal Biovolume Data (cm<sup>3</sup>/m<sup>2</sup>), April 2000 - September 2000

Organism Code	Division Code	Organism	ENR South Test Cell PSTA Treatment		
			4	5	6
NIT NAN	4	NITZSCHIA NANA	--	--	--
NIT PAL	4	NITZSCHIA PALEA	0.347	--	0.035
NIT PALE	4	NITZSCHIA PALEACEA	0.023	0.026	--
NIT PALF	4	NITZSCHIA PALEAFORMIS	--	--	--
NIT SCA	4	NITZSCHIA SCALARIS	--	--	12.276
NIT SEM	4	NITZSCHIA SEMIROBUSTA	0.328	1.635	0.525
NIT SERP	4	NITZSCHIA SERPENTIRAPHE	0.901	1.286	3.920
G NIT	4	NITZSCHIA SP	0.003	--	0.031
G NIT ME	4	NITZSCHIA SP (MEDIUM)	--	--	0.257
G NIT SM	4	NITZSCHIA SP (SMALL)	0.060	0.008	0.007
PIN VIR	4	PINNULARIA VIRIDIS	--	--	--
PIN VIR MI	4	PINNULARIA VIRIDIS V MINOR	--	--	--
RHO GIBA	4	RHOPALODIA GIBBA	17.095	3.703	--
G STE	4	STEPHANODISCUS SP	--	--	--
SYN ACU	4	SYNEDRA ACUS	--	--	--
OPH DES MI	7	OPHIOCYTIUM DESERTUM V MINOR	--	--	--
G EUG	10	EUGLENA SP	4.261	--	--
G CHI	11	CHILOMONAS SP	--	--	--
G CHRM	11	CHROOMONAS SP	--	--	--
G CRY	11	CRYPTOMONAS SP	--	--	--
G GYM SM	12	GYMNODINIUM SP (SMALL)	--	--	--
PER INC	12	PERIDINIUM INCONSPICUUM	--	--	--
PER PUS	12	PERIDINIUM PUSILLUM	--	--	--

**EXHIBIT B-13**Summary of Macrophyte Biomass Data (g dry/m<sup>2</sup>) from the Test Cells

Month	Treatment (Cell)		
	4	5	6
	13	8	3
Apr-00	87	369	23
May-00	25	401	76
Jun-00	160	132	84
Jul-00	270	389	396
Aug-00	466	415	70
Sep-00	632	612	56
Treatment Average	273	386	118

**Exhibit B-14**

Monthly Summaries of PAR Extinction Measurements from the ENR Test Cells, April 2000 - September 2000

Treatment	Date	Water Depth (m)	PAR ( $\mu\text{mol/m}^2/\text{s}$ )		Z (m)	Ext Coeff ( $\text{m}^{-1}$ )
			Surface	Bottom		
<b>Monthly</b> 4	Apr-00	0.24	1107.6	788.6	0.11	2.76
	May-00	--	--	--	--	--
	Jun-00	0.30	385.3	134.7	0.18	6.54
	Jul-00	0.29	451.3	145.9	0.17	8.35
	Aug-00	0.28	849.7	142.6	0.15	12.74
	Sep-00	0.36	502.4	22.4	0.23	14.00
5	Apr-00	0.24	932.5	473.7	0.12	4.30
	May-00	0.24	1742.7	1446.8	0.12	1.73
	Jun-00	0.27	196.7	103.1	0.15	8.18
	Jul-00	0.29	473.2	165.6	0.17	6.75
	Aug-00	0.27	347.1	187.5	0.15	5.03
	Sep-00	0.32	315.6	18.5	0.19	19.45
6	Apr-00	0.07	--	--	-0.05	--
	May-00	--	--	--	--	--
	Jun-00	0.43	190.5	91.1	0.31	2.42
	Jul-00	0.51	480.1	145.7	0.39	3.18
	Aug-00	0.56	1751.1	666.0	0.44	2.79
	Sep-00	0.38	789.6	290.0	0.26	3.65

**Notes:**Extinction coefficient =  $(\ln \text{PARsurf} - \ln \text{PARbot})/z$  and  $z$  = water depth - 0.122 m

PAR in Treatment 4 (Test Cell 13) influenced by macrophyte and submerged aquatic vegetation shading

**Exhibit B-15**

Monthly Summaries of Ecosystem Metabolism Data from the ENR Test Cells, April 2000 - September 2000

Treatment	Cell	Date	NPP(day) g/m <sup>2</sup> /d	GPP(day) g/m <sup>2</sup> /d	CR(24hr) g/m <sup>2</sup> /d	CM(24hr) g/m <sup>2</sup> /d	NPP(24hr) g/m <sup>2</sup> /d	Avg Night Res g/m <sup>2</sup> /hr	PAR(24hr) E/m <sup>2</sup> /d	Efficiency %
<b>Monthly</b>										
4	13	Apr-00	--	--	--	--	--	--	--	--
		May-00	-0.593	1.347	3.070	1.347	-1.723	0.128	43.2	0.597
		Jun-00	3.683	9.746	9.095	9.746	0.652	0.379	35.0	5.327
		Jul-00	2.793	8.083	8.050	8.083	0.032	0.335	33.4	4.637
		Aug-00	0.073	2.333	3.842	2.333	-1.509	0.160	28.3	1.578
		Sep-00	-1.395	0.032	2.448	0.032	-2.415	0.102	29.8	0.021
5	8	Apr-00	--	--	--	--	--	--	--	--
		May-00	3.216	8.109	7.828	8.109	0.281	0.326	44.9	3.456
		Jun-00	2.374	7.333	7.513	7.333	-0.180	0.313	36.1	3.887
		Jul-00	2.153	7.302	7.838	7.302	-0.537	0.327	23.2	6.033
		Aug-00	0.330	3.295	5.082	3.295	-1.787	0.212	38.0	1.659
		Sep-00	--	--	--	--	--	--	--	--
6	3	Apr-00	--	--	--	--	--	--	--	--
		May-00	--	--	--	--	--	--	--	--
		Jun-00	1.128	2.904	2.695	2.904	0.209	0.112	36.0	1.543
		Jul-00	2.704	6.620	5.958	6.620	0.662	0.248	36.3	3.492
		Aug-00	3.621	7.693	6.849	7.693	0.844	0.285	32.5	4.530
		Sep-00	1.545	3.438	3.323	3.438	0.116	0.138	23.2	2.832

**Notes:**

Photosynthetic efficiency is calculated with above-water PAR and the assumption that 1 g O<sub>2</sub>/m<sup>2</sup> equals 10 kcal and 1 Einstein (E) of photons equals 52.27 kcal.

**Exhibit B-16**

South Test Cells PSTA Research Sediment Trap Data - Phase 2, April 2000- September 2000

Site	Tank	Soil	Treatment	Date Installed	Date Collected	PSTA #	Sediment Volume (ml)	# Days	Wet Accretion (ml/m <sup>2</sup> /y)	Dry Accretion (g/m <sup>2</sup> /y)	TP Accretion (g/m <sup>2</sup> /y)	Wet Bulk Density (g/cm <sup>3</sup> )	Dry Bulk Density (g/cm <sup>3</sup> )	Wet Weight (g)	Dry Weight (g)	Moisture Content (%)	TP (mg/kg)	Ash (%)
STC	13-A	peat_limed	4	7/31/00	10/10/00	258	235	71	78448	15369	4.977	0.742	0.196	174.37	46.04	73.6	323.8	89.3
STC	13-B	peat_limed	4	7/31/00	10/10/00	259	230	71	76779	4338	3.147	0.607	0.056	139.67	12.99	90.7	725.4	77.0
STC	13-C	peat_limed	4	7/31/00	10/10/00	260	240	71	80117	15262	4.814	0.807	0.190	193.67	45.72	76.4	315.5	91.3
STC	13-D	peat_limed	4	7/31/00	10/10/00	261	140	71	46735	1086	0.772	0.420	0.023	58.78	3.25	94.5	711.6	70.9
STC	13-E	peat_limed	4	7/31/00	10/10/00	262	240	71	80117	1288	1.257	0.493	0.016	118.30	3.86	96.7	975.6	67.4
STC	13-F	peat_limed	4	7/31/00	10/10/00	263	240	71	80117	2858	2.367	0.520	0.036	124.88	8.56	93.1	828.2	70.7
STC	8-A	shell	5	7/31/00	10/10/00	252	510	71	170249	2012	1.614	0.342	0.012	174.27	6.03	96.5	802.3	54.1
STC	8-B	shell	5	7/31/00	10/10/00	253	470	71	156896	2502	1.919	0.404	0.016	190.07	7.49	96.1	767.1	53.3
STC	8-C	shell	5	7/31/00	10/10/00	254	160	71	53411	2283	1.632	0.607	0.043	97.13	6.84	93.0	714.7	75.7
STC	8-D	shell	5	7/31/00	10/10/00	255	470	71	156896	3974	2.097	0.465	0.025	218.57	11.90	94.6	527.8	65.1
STC	8-E	shell	5	7/31/00	10/10/00	256	200	71	66764	2798	2.694	0.567	0.042	113.41	8.38	92.6	962.8	77.3
STC	8-F	shell	5	7/31/00	10/10/00	257	640	71	213646	7290	8.139	0.544	0.034	348.47	21.84	93.7	1116.4	61.4
STC	3-A	shell	6	7/31/00	10/10/00	246	630	71	210307	1827	1.196	0.217	0.009	136.83	5.47	96.0	654.9	59.2
STC	3-B	shell	6	7/31/00	10/10/00	247	760	71	253704	2331	1.087	0.304	0.009	230.67	6.98	97.0	466.3	57.5
STC	3-C	shell	6	7/31/00	10/10/00	248	525	71	175256	1958	1.925	0.323	0.011	169.77	5.87	96.5	982.9	50.0
STC	3-D	shell	6	7/31/00	10/10/00	249	510	71	170249	1964	0.874	0.348	0.012	177.57	5.88	96.7	444.7	54.8
STC	3-E	shell	6	7/31/00	10/10/00	250	310	71	103485	2486	1.494	0.419	0.024	129.98	7.45	94.3	601.0	70.0
STC	3-F	shell	6	7/31/00	10/10/00	251	170	71	56750	1059	0.795	0.491	0.019	83.54	3.17	96.2	750.3	55.2

Sample Area = 154 cm<sup>2</sup> (14.0 cm diameter)

Assume BD = 0.05 g/cm<sup>3</sup> when not determined

Assume TP = 0.05% when not determined

APPENDIX C

## **Porta-PSTA Mesocosms**

---

**Exhibit C-1**

Water Balances for the Phase 2 Porta-PSTA Treatments, April 2000 - October 2000

Treatment	Month	Depth (m)	HLR (cm/d)	Inflow		Outflow		Rainfall		ET		ΔSTORAGE (m³)	Residual (m³)	Residual (% of inflow)
				(m³/d)	(m³)	(m³/d)	(m³)	(in)	(m³)	(mm)	(m³)			
3	Apr-2000	0.300	5.31	0.324	10.06	0.315	9.77	4.90	0.75	142.60	0.86	0.000	0.33	3.13
	May-2000	0.300	6.99	0.408	12.63	0.381	11.81	0.76	0.12	165.76	0.99	-0.012	-0.04	-0.44
	Jun-2000	0.302	8.99	0.537	16.66	0.530	16.42	1.37	0.21	139.80	0.84	0.018	-0.41	-2.43
	Jul-2000	0.298	8.40	0.506	15.69	0.493	15.29	7.42	1.13	131.78	0.79	-0.037	0.77	5.50
	Aug-2000	0.301	8.17	0.483	14.98	0.465	14.41	2.30	0.35	129.00	0.77	0.018	0.12	1.09
	Sep-2000	0.303	7.68	0.443	13.73	0.393	12.20	7.08	1.08	112.51	0.68	0.000	1.93	12.93
	Oct-2000	0.302	6.22	0.373	11.57	0.364	11.27	10.82	1.65	--	--	0.012	--	--
4	Apr-2000	0.367	4.34	0.271	8.40	0.263	8.16	4.90	0.75	142.60	0.86	0.037	0.09	0.96
	May-2000	0.368	7.37	0.431	13.35	0.463	14.36	0.76	0.12	165.76	0.99	0.006	-1.90	-13.84
	Jun-2000	0.369	8.94	0.536	16.61	0.552	17.11	1.37	0.21	139.80	0.84	0.012	-1.14	-6.28
	Jul-2000	0.372	7.93	0.456	14.13	0.468	14.52	7.42	1.13	131.78	0.79	0.043	-0.10	-0.47
	Aug-2000	0.369	8.90	0.536	16.61	0.550	17.05	2.30	0.35	129.00	0.77	0.018	-0.88	-5.05
	Sep-2000	0.369	8.60	0.518	16.07	0.485	15.05	7.08	1.08	112.51	0.68	-0.006	1.43	8.52
	Oct-2000	0.369	8.95	0.537	16.65	0.529	16.41	10.82	1.65	--	--	-0.006	--	--
7	Apr-2000	0.406	5.19	0.321	9.95	0.300	9.29	4.90	0.75	142.60	0.86	0.786	-0.23	-2.11
	May-2000	0.364	7.68	0.467	14.47	0.498	15.44	0.76	0.12	165.76	0.99	0.018	-1.87	-12.83
	Jun-2000	0.366	8.35	0.490	15.18	0.505	15.65	1.37	0.21	139.80	0.84	0.037	-1.14	-7.38
	Jul-2000	0.365	8.87	0.521	16.17	0.500	15.50	7.42	1.13	131.78	0.79	-0.018	1.03	5.94
	Aug-2000	0.366	8.37	0.492	15.24	0.491	15.21	2.30	0.35	129.00	0.77	0.000	-0.39	-2.51
	Sep-2000	0.366	7.48	0.465	14.41	0.400	12.40	7.08	1.08	112.51	0.68	-0.018	2.43	15.69
	Oct-2000	0.379	8.10	0.486	15.07	0.428	13.28	10.82	1.65	--	--	0.165	--	--
11	Apr-2000	0.340	5.37	0.978	30.33	0.970	30.06	4.90	2.24	142.60	2.57	-0.055	0.00	0.00
	May-2000	0.335	6.78	1.137	35.25	1.116	34.60	0.76	0.35	165.76	2.98	0.000	-1.99	-5.58
	Jun-2000	0.336	9.15	1.667	51.67	1.686	52.25	1.37	0.63	139.80	2.52	0.110	-2.58	-4.93
	Jul-2000	0.338	8.56	1.555	48.21	1.569	48.63	7.42	3.39	131.78	2.37	0.110	0.50	0.96
	Aug-2000	0.347	9.53	1.710	53.01	1.696	52.58	2.30	1.05	129.00	2.32	0.000	-0.84	-1.55
	Sep-2000	0.340	9.18	1.575	48.82	1.515	46.97	7.08	3.24	112.51	2.03	-0.110	3.17	6.09
	Oct-2000	0.341	13.10	2.358	73.10	2.437	75.55	10.82	4.95	--	--	0.110	--	--
12	Apr-2000	0.331	5.73	1.037	32.14	1.009	31.27	4.90	2.24	142.60	2.57	0.110	0.43	1.26
	May-2000	0.332	6.70	1.138	35.27	1.134	35.14	0.76	0.35	165.76	2.98	0.055	-2.57	-7.21
	Jun-2000	0.333	9.67	1.732	53.70	1.797	55.71	1.37	0.63	139.80	2.52	0.055	-3.95	-7.28
	Jul-2000	0.333	9.08	1.660	51.46	1.726	53.50	7.42	3.39	131.78	2.37	-0.055	-0.97	-1.76
	Aug-2000	0.334	8.17	1.446	44.83	1.403	43.49	2.30	1.05	129.00	2.32	0.110	-0.04	-0.09
	Sep-2000	0.334	8.57	1.569	48.63	1.506	46.68	7.08	3.24	112.51	2.03	-0.055	3.21	6.19
	Oct-2000	0.335	8.94	1.609	49.89	1.580	48.99	10.82	4.95	--	--	0.110	--	--
13	Apr-2000	0.277	5.67	0.346	10.73	0.368	11.41	4.90	0.75	142.60	0.86	0.957	-1.74	-15.07
	May-2000	0.337	7.35	0.437	13.54	0.437	13.54	0.76	0.12	165.76	0.99	-0.043	-0.84	-6.10
	Jun-2000	0.340	8.47	0.522	16.19	0.525	16.26	1.37	0.21	139.80	0.84	0.006	-0.71	-3.79
	Jul-2000	0.336	8.64	0.535	16.57	0.555	17.22	7.42	1.13	131.78	0.79	0.018	-0.33	-1.71
	Aug-2000	0.357	8.62	0.521	16.14	0.484	15.01	2.30	0.35	129.00	0.77	0.530	0.18	0.50
	Sep-2000	0.339	8.75	0.512	15.86	0.481	14.90	7.08	1.08	112.51	0.68	0.000	1.36	8.01
	Oct-2000	0.339	9.10	0.546	16.93	0.514	15.94	10.82	1.65	--	--	0.000	--	--
14	Apr-2000	0.296	5.49	0.333	10.33	0.338	10.48	4.90	0.75	142.60	0.86	0.311	-0.56	-5.71
	May-2000	0.312	7.54	0.444	13.77	0.477	14.80	0.76	0.12	165.76	0.99	0.043	-1.95	-14.14
	Jun-2000	0.314	8.67	0.514	15.92	0.722	22.38	1.37	0.21	139.80	0.84	0.012	-7.10	-44.67
	Jul-2000	0.309	8.10	0.450	13.94	0.461	14.28	7.42	1.13	131.78	0.79	-0.006	0.01	-0.41
	Aug-2000	0.314	8.71	0.526	16.29	0.563	17.45	2.30	0.35	129.00	0.77	0.018	-1.60	-9.63
	Sep-2000	0.315	9.21	0.559	17.34	0.553	17.13	7.08	1.08	112.51	0.68	0.000	0.61	3.26
	Oct-2000	0.314	9.14	0.548	17.00	0.547	16.96	10.82	1.65	--	--	0.000	--	--

**Exhibit C-1**

Water Balances for the Phase 2 Porta-PSTA Treatments, April 2000 - October 2000

Treatment	Month	Depth (m)	HLR (cm/d)	Inflow		Outflow		Rainfall		ET		ΔSTORAGE (m³)	Residual (m³)	Residual (% of inflow)
				(m³/d)	(m³)	(m³/d)	(m³)	(in)	(m³)	(mm)	(m³)			
15	Apr-2000	0.343	4.92	0.295	9.16	0.261	8.08	4.90	0.75	142.60	0.86	0.140	0.82	8.33
	May-2000	0.344	6.70	0.392	12.14	0.360	11.15	0.76	0.12	165.76	0.99	-0.006	0.11	0.76
	Jun-2000	0.347	8.64	0.516	16.01	0.507	15.70	1.37	0.21	139.80	0.84	0.043	-0.36	-2.20
	Jul-2000	0.346	8.29	0.505	15.67	0.459	14.24	7.42	1.13	131.78	0.79	0.000	1.77	11.80
	Aug-2000	0.346	7.40	0.444	13.76	0.428	13.25	2.30	0.35	129.00	0.77	0.012	0.07	1.40
	Sep-2000	0.346	7.31	0.436	13.52	0.399	12.36	7.08	1.08	112.51	0.68	-0.024	1.59	11.78
	Oct-2000	0.347	8.62	0.517	16.03	0.474	14.69	10.82	1.65	--	--	-0.006	--	--
16	Apr-2000	0.063	--	0.205	6.36	0.029	0.89	4.90	0.75	142.60	0.86	-1.006	6.37	91.35
	May-2000	0.190	7.61	0.396	12.26	0.285	8.84	0.76	0.12	165.76	0.99	2.079	0.46	5.17
	Jun-2000	0.358	16.18	0.952	29.51	0.991	30.72	1.37	0.21	139.80	0.84	-0.037	-1.80	-6.06
	Jul-2000	0.358	19.16	1.147	35.56	1.214	37.64	7.42	1.13	131.78	0.79	-0.024	-1.71	-4.63
	Aug-2000	0.376	17.68	1.086	33.67	1.165	36.12	2.30	0.35	129.00	0.77	0.530	-3.40	-10.05
	Sep-2000	0.359	17.46	1.027	31.82	1.042	32.31	7.08	1.08	112.51	0.68	-0.006	-0.07	-0.04
	Oct-2000	0.360	17.32	1.039	32.22	1.056	32.74	10.82	1.65	--	--	-0.006	--	--
17	Apr-2000	0.232	5.62	0.337	10.45	0.299	9.26	4.90	0.75	142.60	0.86	2.432	-1.35	-12.06
	May-2000	0.331	7.80	0.494	15.32	0.518	16.05	0.76	0.12	165.76	0.99	0.037	-1.65	-10.66
	Jun-2000	0.332	8.37	0.469	14.55	0.491	15.22	1.37	0.21	139.80	0.84	0.055	-1.35	-9.18
	Jul-2000	0.330	7.88	0.472	14.64	0.610	18.91	7.42	1.13	131.78	0.79	-0.037	-3.90	-24.71
	Aug-2000	0.328	6.63	0.399	12.37	0.398	12.34	2.30	0.35	129.00	0.77	0.037	-0.43	-3.37
	Sep-2000	0.331	7.88	0.488	15.11	0.466	14.44	7.08	1.08	112.51	0.68	-0.055	1.13	6.97
	Oct-2000	0.329	8.10	0.486	15.07	0.468	14.51	10.82	1.65	--	--	0.000	--	--
18	Apr-2000	0.468	5.59	0.347	10.76	0.311	9.63	4.90	0.75	142.60	0.86	0.384	0.64	5.52
	May-2000	0.328	9.48	0.602	18.65	0.505	15.66	0.76	0.12	165.76	0.99	0.110	1.99	10.63
	Jun-2000	0.329	8.34	0.515	15.96	0.517	16.03	1.37	0.21	139.80	0.84	0.000	-0.70	-4.31
	Jul-2000	0.331	6.94	0.432	13.39	0.658	20.41	7.42	1.13	131.78	0.79	-0.018	-6.66	-45.83
	Aug-2000	0.326	7.70	0.487	15.08	0.561	17.38	2.30	0.35	129.00	0.77	0.018	-2.74	-17.74
	Sep-2000	0.327	8.52	0.490	15.18	0.554	17.19	7.08	1.08	112.51	0.68	0.000	-1.60	-9.87
	Oct-2000	0.322	8.88	0.533	16.52	0.605	18.75	10.82	1.65	--	--	-0.018	--	--
19	Apr-2000	0.437	6.59	0.360	11.16	0.443	13.74	4.90	0.75	142.60	0.86	-1.408	-1.28	-10.75
	May-2000	0.331	6.71	0.406	12.60	0.488	15.14	0.76	0.12	165.76	0.99	0.018	-3.43	-27.00
	Jun-2000	0.333	9.05	0.528	16.36	0.544	16.87	1.37	0.21	139.80	0.84	0.000	-1.14	-6.90
	Jul-2000	0.333	8.93	0.513	15.91	0.545	16.90	7.42	1.13	131.78	0.79	-0.018	-0.63	-3.70
	Aug-2000	0.335	7.92	0.458	14.21	0.470	14.57	2.30	0.35	129.00	0.77	-0.018	-0.77	-5.30
	Sep-2000	0.336	7.96	0.458	14.19	0.468	14.51	7.08	1.08	112.51	0.68	-0.037	0.12	0.80
	Oct-2000	0.340	9.48	0.569	17.63	0.679	21.04	10.82	1.65	--	--	-0.018	--	--

## Exhibit C-2

Monthly Average Values of Selected Field Parameters Collected at the Porta-PSTA Head Tank and Twelve Porta-PSTA Treatments, Phase 2, April 2000 - October 2000

Parameter	Month	Head Tank	Treatment											
			3 (Peat)	4 (Shellrock)	7 (Sand)	11 (Shellrock)	12 (Peat)	13 (Peat-Ca amended)	14 (Limerock)	15 (Shellrock-Increased Velocity)	16 (Shellrock-Variable Stage)	17 (Sand- Acid Rinsed)	18 (None)	19 (None-Aquamat)
			Outflow	Outflow	Outflow	Outflow	Outflow	Outflow	Outflow	Outflow	Outflow	Outflow	Outflow	Outflow
Water Temp (deg C)	Apr-00	24.94	23.48	23.69	23.46	24.19	23.27	23.83	24.30	26.58	26.55	23.94	24.02	23.50
	May-00	29.19	27.37	26.87	27.07	26.74	25.80	26.96	28.38	29.63	27.73	27.26	27.53	28.53
	Jun-00	29.96	28.42	28.25	27.93	29.01	28.39	28.11	28.54	31.60	29.24	28.31	28.00	28.38
	Jul-00	30.04	28.96	28.68	28.89	28.04	28.20	28.36	29.57	31.40	29.01	28.92	28.22	28.79
	Aug-00	30.90	28.69	28.99	29.10	29.08	29.14	28.40	28.99	31.99	29.05	28.62	28.30	28.45
	Sep-00	29.91	28.21	29.46	27.13	27.87	28.50	29.61	28.13	30.34	29.36	27.79	28.23	27.25
	Oct-00	27.45	27.24	26.92	26.76	27.51	25.70	25.41	25.97	28.61	26.89	27.47	27.34	27.59
pH (units)	Apr-00	7.18	7.11	7.89	8.06	7.69	7.14	8.62	7.53	7.49	7.71	7.88	7.91	7.94
	May-00	7.22	7.06	7.71	7.69	7.61	7.18	7.96	7.81	7.62	7.84	8.23	8.14	8.15
	Jun-00	7.36	6.98	7.53	7.75	7.57	6.90	7.80	7.85	7.40	7.71	8.20	8.16	8.18
	Jul-00	7.19	6.95	7.55	7.59	7.41	7.01	7.90	7.65	7.36	7.57	7.85	8.09	7.80
	Aug-00	7.32	7.11	7.47	7.47	7.43	7.22	7.77	7.48	7.40	7.45	7.61	7.82	7.69
	Sep-00	7.25	6.93	7.40	7.48	7.58	7.22	7.58	7.63	7.63	7.50	7.58	7.79	7.92
	Oct-00	--	--	--	--	7.62	7.30	--	7.68	7.37	--	--	--	--
Conductivity ( $\mu\text{mhos/cm}$ )	Apr-00	925	883	787	728	879	960	722	897	881	1009	902	906	942
	May-00	1011	1008	961	916	1000	1135	1025	905	1095	930	905	1004	895
	Jun-00	958	940	929	877	1044	962	929	940	1006	980	899	948	978
	Jul-00	910	952	964	962	913	994	957	869	1014	931	875	856	848
	Aug-00	1246	1127	1166	1085	1236	1229	1069	1151	1153	1209	1191	1178	1155
	Sep-00	1181	1098	1170	1149	1182	1074	1425	1008	1208	1156	983	977	1040
	Oct-00	--	--	--	--	1189	963	--	959	1017	--	--	--	--
Salinity (ppt)	Apr-00	--	0.46	0.41	0.37	0.46	0.51	--	0.47	0.46	0.53	0.47	0.47	0.49
	May-00	--	0.53	0.50	0.47	0.52	0.60	0.54	0.47	0.58	0.49	0.47	0.53	0.46
	Jun-00	--	0.49	0.48	0.45	0.55	0.50	0.48	0.49	0.53	0.51	0.47	0.50	0.52
	Jul-00	--	0.50	0.51	0.51	0.47	0.52	0.50	0.45	0.53	0.49	0.45	0.44	0.44
	Aug-00	--	0.59	0.61	0.57	0.65	0.65	0.56	0.60	0.60	0.64	0.63	0.62	0.61
	Sep-00	--	0.58	0.62	0.61	0.62	--	0.78	0.53	0.65	0.61	0.51	0.51	0.54
	Oct-00	--	--	--	--	0.63	0.50	--	0.50	0.53	--	--	--	--
Total Dissolved Solids (g/L)	Apr-00	0.592	0.565	0.503	0.466	0.562	0.615	0.467	0.574	0.564	0.646	0.577	0.580	0.603
	May-00	0.646	0.645	0.615	0.586	0.640	0.726	0.656	0.581	0.701	0.595	0.579	0.643	0.573
	Jun-00	0.613	0.602	0.595	0.561	0.668	0.616	0.596	0.602	0.644	0.628	0.576	0.607	0.626
	Jul-00	0.556	0.610	0.617	0.616	0.584	0.636	0.612	0.556	0.649	0.596	0.560	0.548	0.543
	Aug-00	0.797	0.721	0.746	0.695	0.791	0.787	0.684	0.737	0.738	0.773	0.762	0.753	0.739
	Sep-00	0.718	0.703	0.749	0.736	0.756	0.720	0.912	0.645	0.773	0.740	0.629	0.626	0.665
	Oct-00	0.803	0.759	0.764	0.745	0.762	0.622	0.768	0.625	0.659	0.791	0.759	0.741	0.759
Dissolved Oxygen Saturation (%)	Apr-00	48.0	71.9	114.0	128.2	118.6	68.7	57.0	84.5	63.3	88.2	111.5	101.9	111.3
	May-00	45.2	69.5	99.9	95.7	101.3	65.9	67.4	108.3	84.6	104.6	141.0	127.2	123.1
	Jun-00	52.0	55.4	88.2	103.2	87.2	46.9	94.6	115.2	85.3	100.1	159.7	121.8	128.0
	Jul-00	45.6	40.9	91.4	82.5	87.6	51.5	97.8	91.1	76.5	98.2	129.9	117.4	113.0
	Aug-00	42.7	43.8	93.2	105.7	94.0	65.6	113.5	103.6	89.1	89.8	114.8	110.1	124.3
	Sep-00	27.0	38.6	87.5	49.9	86.4	42.8	57.2	98.9	96.4	86.7	95.2	112.7	122.3
	Oct-00	43.5	46.0	78.2	103.6	88.6	53.2	69.9	98.6	65.4	72.0	89.6	100.9	106.1
Dissolved Oxygen (mg/L)	Apr-00	3.96	6.04	9.56	10.64	9.96	5.83	4.83	7.02	5.07	7.05	9.34	8.38	9.37
	May-00	3.46	5.41	7.89	7.48	8.02	5.31	5.24	8.37	6.38	8.03	11.09	9.97	9.48
	Jun-00	3.93	4.28	6.83	7.95	6.69	3.54	7.34	8.87	6.22	7.61	12.27	9.46	9.99
	Jul-00	3.56	3.10	6.97	6.30	6.80	3.98	7.49	6.86	5.61	7.52	9.93	9.11	8.67
	Aug-00	3.16	3.35	7.08	8.05	7.14	4.93	8.73	7.86	6.46	6.82	8.81	8.58	9.60
	Sep-00	2.05	2.97	6.60	3.88	6.75	3.26	4.30	7.64	7.22	6.56	7.44	8.69	9.50
	Oct-00	3.42	3.65	6.21	8.16	6.94	4.32	5.56	7.97	5.04	5.74	7.09	7.95	8.38

## Exhibit C-3

Monthly Average Values of Water Quality Data Collected at the Porta-PSTA Head Tank and Twelve Porta-PSTA Treatments, April 2000 - October 2000

		Treatment																							
		3 (Peat)		4 (Shellrock)		7 (Sand)		11 (Shellrock)		12 (Peat)		13 (Peat- Ca amended)		14 (Limerock)		15 (Shellrock- Increased Variable Stage)		16 (Shellrock- Rinsed)		17 (Sand- Acid Rinsed)		18 (None)		19 (None- Aquamat)	
Parameter	Month	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow										
Total Phosphorus as P (mg/L)	Apr-00	0.038	0.020	0.039	0.018	0.036	0.018	0.037	0.023	0.036	0.027	0.042	0.023	0.037	0.024	0.036	0.028	--	--	0.041	0.030	0.038	0.028	0.035	0.023
	May-00	0.053	0.019	0.054	0.017	0.055	0.018	0.055	0.023	0.054	0.020	0.054	0.028	0.053	0.018	0.054	0.022	0.039	0.021	0.052	0.019	0.053	0.023	0.054	0.018
	Jun-00	0.028	0.020	0.028	0.017	0.028	0.015	0.028	0.022	0.028	0.027	0.028	0.021	0.028	0.019	0.028	0.018	0.028	0.021	0.028	0.013	0.028	0.017	0.028	0.023
	Jul-00	0.021	0.018	0.020	0.014	0.020	0.011	0.020	0.020	0.020	0.018	0.020	0.018	0.021	0.014	0.020	0.016	0.021	0.018	0.020	0.010	0.020	0.015	0.020	0.014
	Aug-00	0.019	0.017	0.019	0.012	0.019	0.011	0.019	0.013	0.019	0.017	0.020	0.012	0.019	0.013	0.019	0.012	0.019	0.013	0.019	0.009	0.019	0.012	0.019	0.010
	Sep-00	0.028	0.020	0.028	0.013	0.028	0.021	0.028	0.018	0.028	0.018	0.028	0.014	0.028	0.013	0.028	0.018	0.028	0.016	0.028	0.013	0.028	0.019	0.028	0.010
	Oct-00	0.017	0.016	0.016	0.010	0.016	0.010	0.014	0.011	0.014	0.012	0.016	0.009	0.015	0.012	0.016	0.009	0.015	0.011	0.015	0.010	0.020	0.008	0.015	0.007
Total Particulate Phosphorus (mg/L)	Apr-00	0.020	0.008	0.022	0.007	0.018	0.008	0.019	0.010	0.019	0.015	0.025	0.010	0.019	0.010	0.019	0.013	--	--	0.022	0.014	0.020	0.017	0.017	0.011
	May-00	0.035	0.008	0.035	0.007	0.036	0.007	0.036	0.009	0.034	0.008	0.035	0.013	0.035	0.007	0.035	0.010	0.020	0.009	0.033	0.008	0.034	0.010	0.035	0.004
	Jun-00	0.010	0.007	0.010	0.006	0.010	0.004	0.010	0.010	0.010	0.014	0.010	0.008	0.010	0.008	0.010	0.007	0.010	0.008	0.010	0.003	0.010	0.004	0.010	0.010
	Jul-00	0.005	0.010	0.005	0.007	0.005	0.004	0.005	0.012	0.005	0.008	0.005	0.009	0.005	0.007	0.005	0.008	0.005	0.010	0.004	0.004	0.005	0.008	0.006	
	Aug-00	0.005	0.009	0.005	0.006	0.005	0.006	0.005	0.006	0.005	0.009	0.006	0.006	0.005	0.007	0.006	0.006	0.006	0.005	0.004	0.005	0.003	0.005	0.004	
	Sep-00	0.016	0.011	0.016	0.005	0.016	0.015	0.016	0.010	0.016	0.009	0.016	0.007	0.016	0.006	0.016	0.016	0.009	0.016	0.007	0.016	0.006	0.016	0.002	
	Oct-00	0.004	0.009	0.005	0.005	0.004	0.002	0.002	0.004	0.003	0.005	0.004	0.003	0.005	0.007	0.004	0.004	0.005	0.005	0.004	0.003	0.009	0.001	0.004	
Total Dissolved Phosphorus (mg/L)	Apr-00	0.018	0.012	0.018	0.011	0.018	0.010	0.018	0.013	0.018	0.012	0.018	0.015	0.018	0.013	0.017	0.015	--	--	0.018	0.013	0.018	0.011	0.018	0.012
	May-00	0.019	0.012	0.019	0.010	0.019	0.011	0.019	0.014	0.019	0.012	0.019	0.015	0.019	0.011	0.019	0.012	0.019	0.013	0.019	0.011	0.019	0.015	0.014	
	Jun-00	0.018	0.013	0.018	0.011	0.018	0.010	0.018	0.012	0.018	0.013	0.018	0.013	0.018	0.011	0.018	0.013	0.018	0.013	0.018	0.011	0.018	0.014	0.013	
	Jul-00	0.015	0.008	0.015	0.007	0.015	0.007	0.015	0.008	0.015	0.010	0.015	0.010	0.015	0.007	0.015	0.008	0.015	0.008	0.015	0.006	0.015	0.008	0.015	
	Aug-00	0.014	0.008	0.014	0.006	0.014	0.014	0.014	0.007	0.013	0.007	0.014	0.006	0.014	0.005	0.014	0.006	0.014	0.009	0.014	0.006	0.014	0.008	0.013	
	Sep-00	0.013	0.009	0.013	0.008	0.013	0.006	0.013	0.008	0.013	0.009	0.013	0.007	0.013	0.007	0.013	0.008	0.013	0.009	0.013	0.007	0.013	0.008	0.013	
	Oct-00	0.012	0.006	0.011	0.005	0.011	0.006	0.012	0.007	0.011	0.006	0.012	0.006	0.011	0.005	0.011	0.007	0.011	0.007	0.011	0.007	0.011	0.007	0.011	
Dissolved Reactive Phosphorus (mg/L)	Apr-00	0.004	--	0.004	--	0.004	--	0.004	--	0.004	--	0.004	--	0.004	--	0.004	--	--	--	0.004	--	0.004	--	0.004	--
	May-00	0.005	--	0.005	--	0.005	--	0.005	--	0.005	--	0.005	--	0.005	--	0.005	--	0.005	--	0.005	--	0.005	--	0.005	--
	Jun-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	Jul-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	Aug-00	0.008	0.003	0.007	0.002	0.007	0.001	0.008	0.001	0.008	0.001	0.007	0.001	0.007	0.001	0.007	0.002	0.007	0.001	0.007	0.001	0.008	0.001	0.007	
	Sep-00	0.011	0.003	0.011	0.001	0.011	--	0.011	--	0.011	--	0.003	0.003	0.011	0.001	0.011	0.002	0.011	0.002	0.011	0.001	0.011	0.001	0.011	0.001
	Oct-00	0.006	0.001	0.004	0.002	0.004	0.002	0.005	0.003	0.004	0.005	0.005	0.002	0.004	0.006	0.002	0.006	0.002	0.007	0.003	0.004	0.002	0.004	0.001	
Dissolved Organic Phosphorus (mg/L)	Apr-00	0.014	--	0.014	--	0.014	--	0.014	--	0.014	--	0.013	--	0.014	--	0.014	--	--	--	0.014	--	0.014	--	0.014	--
	May-00	0.013	--	0.014	--	0.014	--	0.014	--	0.013	--	0.014	--	0.014	--	0.014	--	0.014	--	0.014	--	0.014	--	0.014	--
	Jun-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	Jul-00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	Aug-00	0.006	0.004	0.007	0.003	0.006	0.003	0.006	0.004	0.006	0.003	0.007	0.003	0.006	0.003	0.007	0.007	0.006	0.003	0.006	0.004	0.006	0.003	0.003	
	Sep-00	0.003	0.005	0.003	0.008	0.003	--	0.003	--	0.003	--	0.003	0.005	0.003	0.008	0.003	0.004	0.003	0.008	0.003	--	0.003	--	0.003	
	Oct-00	0.006	0.005	0.007	0.003	0.007	0.004	0.007	0.002	0.007	0.004	0.006	0.003	0.005	0.004	0.004	0.004	0.007	0.004	0.007	0.005	0.007	0.005		
Total Nitrogen, as N (mg/L)	Apr-00	1.78	0.42	1.78	1.58	1.78	1.70	1.78	0.51	1.78	0.66	1.78	1.02	1.78	0.43	1.78	0.73	--	--	1.78	0.64	1.78	0.55	1.78	1.41
	May-00	1.82	2.00	1.82	2.15	1.82	2.09	1.82	2.28	1.82	1.80	1.82	2.60	1.82	1.78	1.82	2.29	1.82	--	1.82	1.86	1.82	1.91	1.82	2.04
	Jun-00	2.47	2.29	2.37	2.53	2.15	3.89	2.45	2.46	2.46	2.41	2.33	2.29	2.38	2.08	2.39	2.56	2.42	2.35	2.36	2.35	5.65	2.48	2.39	2.44
	Jul-00	2.36	2.68	2.36	2.62	2.36	2.65	2.36	2.92	2.36	2.35	2.36	2.59	2.36	2.43	2.36	2.70	2.36	2.56	2.36	2.60	2.36	2.56	2.36	3.43
	Aug-00	2.04	2.61	2.04	2.11	2.04	2.75	2.04	2.47	2.04	2.41	2.04	2.28	2.04	1.97	2.04	2.29	2.04	2.19	2.04	2.64	2.04	2.26	2.04	2.42
	Oct-00	1.64	2.42	2.08	2.03	0.62	2.32	2.45	2.37	1.32	2.26	1.73	2.39	1.45	2.07	1.97	2.24	2.36	2.29	2.17	2.28	2.38	2.25	2.28	

## Exhibit C-3

Monthly Average Values of Water Quality Data Collected at the Porta-PSTA Head Tank and Twelve Porta-PSTA Treatments, April 2000 - October 2000

		Treatment																							
		3 (Peat)		4 (Shellrock)		7 (Sand)		11 (Shellrock)		12 (Peat)		13 (Peat- Ca amended)		14 (Limerock)		15 (Shellrock- Increased)		16 (Shellrock- Variable Stage)		17 (Sand- Acid Rinsed)		18 (None)		19 (None- Aquamat)	
Parameter	Month	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow	Inflow <sup>a</sup>	Outflow										
Total Kjeldahl Nitrogen, as N (mg/L)	Apr-00	1.78	0.42	1.78	1.58	1.78	1.70	1.78	0.51	1.78	0.66	1.78	0.98	1.78	0.43	1.78	0.71	--	--	1.78	0.46	1.78	0.55	1.78	1.41
	May-00	1.82	2.00	1.82	2.15	1.82	2.09	1.82	2.28	1.82	1.80	1.82	2.60	1.82	2.00	1.82	2.29	--	--	1.82	1.86	1.82	1.91	1.82	2.04
	Jun-00	2.40	2.29	2.30	2.53	2.08	2.64	2.39	2.46	2.39	2.41	2.26	2.29	2.31	2.06	2.32	2.56	2.35	--	2.30	2.35	5.59	2.48	2.32	2.44
	Jul-00	2.34	2.68	2.34	2.61	2.34	2.65	2.34	2.92	2.34	2.35	2.34	2.59	2.34	2.41	2.34	2.67	2.34	2.56	2.34	2.60	2.34	2.56	2.34	3.42
	Aug-00	2.01	2.58	2.01	2.09	2.01	2.74	2.01	2.47	2.01	2.40	2.01	2.27	2.01	1.96	2.01	2.28	2.01	2.17	2.01	2.64	2.01	2.26	2.01	2.42
	Oct-00	1.63	2.42	2.07	2.03	0.61	2.32	2.44	2.37	1.31	2.26	1.72	2.19	2.37	1.42	1.78	2.07	1.96	2.24	2.35	2.29	2.16	2.28	2.37	2.25
Nitrate/Nitrite, as N (mg/L)	Apr-00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	--	--	0.00	0.00	0.00	0.00	0.00	0.00
	May-00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00
	Jun-00	0.07	0.00	0.07	0.00	0.07	1.25	0.06	0.00	0.07	0.00	0.07	0.00	0.07	0.02	0.07	0.00	0.07	0.00	0.06	0.00	0.06	0.00	0.07	0.00
	Jul-00	0.02	0.00	0.02	0.01	0.02	0.00	0.02	0.00	0.02	0.00	0.02	0.01	0.02	0.02	0.02	0.03	0.02	0.01	0.02	0.00	0.02	0.00	0.02	0.01
	Aug-00	0.03	0.03	0.03	0.02	0.03	0.01	0.03	0.00	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.03	0.00	0.03	0.00	0.03	0.00
	Oct-00	0.01	0.00	0.01	0.00	0.01	0.04	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.02	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00
Ammonia, as NH <sub>3</sub> (mg/L)	Apr-00	0.03	--	0.03	0.03	0.03	0.03	0.03	--	0.03	--	0.03	--	0.03	--	0.03	--	--	--	0.03	--	0.03	--	0.03	0.02
	May-00	0.02	0.00	0.02	0.02	0.02	0.05	0.02	0.04	0.02	0.01	0.02	0.20	0.02	0.00	0.02	0.02	--	0.02	0.00	0.02	0.02	0.02	0.01	
	Jun-00	0.04	0.04	0.04	--	0.04	--	0.07	0.05	0.07	0.11	0.04	0.04	0.04	0.02	0.04	0.03	0.07	0.02	0.05	0.02	0.05	0.05	0.04	
	Jul-00	0.03	--	0.03	--	0.03	--	0.03	--	0.03	--	0.03	--	0.03	--	0.03	--	0.03	--	0.03	--	0.03	--	0.03	--
	Aug-00	0.06	--	0.06	--	0.06	--	0.06	--	0.06	--	0.06	--	0.06	--	0.06	--	0.06	--	0.06	--	0.06	--	0.06	--
	Oct-00	0.00	--	0.00	--	0.00	--	0.00	--	0.00	--	0.00	--	0.00	--	0.00	--	0.00	--	0.00	--	0.00	--	0.00	--
Organic Nitrogen (mg/L)	Apr-00	1.75	--	1.75	1.55	1.75	1.66	1.75	--	1.75	--	1.75	--	1.75	--	1.75	--	--	--	1.75	--	1.75	--	1.75	1.39
	May-00	1.80	1.99	1.80	2.13	1.80	2.06	1.80	2.24	1.80	1.80	1.80	2.39	1.80	1.99	1.80	2.28	1.80	--	1.80	1.86	1.80	1.89	1.80	2.03
	Jun-00	2.36	2.25	2.26	2.49	2.04	2.59	2.32	2.41	2.32	2.30	2.22	2.25	2.27	2.04	2.28	2.53	2.28	2.32	2.25	2.33	5.54	2.43	2.27	2.40
	Jul-00	2.31	--	2.31	--	2.31	--	2.31	--	2.31	--	2.31	--	2.31	--	2.31	--	2.31	--	2.31	--	2.31	--	2.31	--
	Aug-00	1.95	--	1.95	--	1.95	--	1.95	--	1.95	--	1.95	--	1.95	--	1.95	--	1.95	--	1.95	--	1.95	--	1.95	--
	Oct-00	1.63	--	2.07	--	0.61	--	2.44	--	1.31	--	1.72	--	2.37	--	1.78	--	2.35	--	2.35	--	2.16	--	2.37	--
TOC (mg/L)	Apr-00	33.00	28.00	33.00	26.67	33.00	28.00	33.00	29.00	33.00	31.00	33.00	31.00	33.00	25.33	33.00	30.67	--	33.00	31.00	33.00	29.00	33.00	27.00	
	May-00	32.00	37.67	32.00	36.67	32.00	36.00	32.00	37.00	32.00	40.00	32.00	42.33	32.00	38.67	32.00	45.67	32.00	--	32.00	36.00	32.00	37.00	32.00	46.00
	Jun-00	46.67	49.67	38.33	38.33	47.00	48.00	45.00	49.00	48.00	44.00	48.33	41.33	37.33	35.33	40.00	43.33	42.67	45.00	49.00	44.00	53.00	44.00	47.00	
	Jul-00	31.00	35.33	31.00	34.00	31.00	37.00	31.00	28.00	31.00	36.00	31.00	34.67	31.00	31.33	34.67	31.00	33.33	31.00	37.00	31.00	37.00	31.00	36.00	
	Aug-00	42.00	43.00	42.00	42.00	42.00	42.00	42.00	43.00	42.00	43.00	42.00	42.67	42.00	39.00	42.00	42.67	42.00	43.00	42.00	42.00	42.00	42.00	42.00	
	Oct-00	98.67	41.67	97.00	41.00	100.00	42.00	76.00	58.00	78.00	58.00	93.00	40.33	36.67	85.67	50.67	50.67	87.00	48.17	100.00	45.00	52.00	100.00	56.00	
TSS (mg/L)	Apr-00	--	2.47	--	1.80	--	2.00	--	2.60	--	3.80	--	14.33	--	2.27	--	3.33	--	--	--	1.80	--	2.60	--	1.60
	May-00	12.00	4.67	12.00	3.00	12.00	6.00	12.00	7.00	12.00	4.00	12.00	3.67	12.00	3.00	12.00	4.33	12.00	--	12.00	4.00	12.00	3.00	12.00	4.00
	Jun-00	1.33	1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	1.00	1.00	1.33	1.00	1.00	1.33	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	
	Jul-00	1.00	2.33	1.00	1.00	1.33	1.00	1.00	1.00	1.00	3.00	1.00	1.33	1.00	2.00	1.00	3.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	Aug-00	4.00	2.00	4.00	2.67	4.00	1.00	4.00	1.00	4.00	2.00	4.00	3.00	4.00	3.00	4.00	3.67	4.00	4.00	3.33	4.00	1.00	2.00	4.00	
	Oct-00	3.33	7.00	5.33	3.33	1.00	1.00	17.00	1.00	12.00	6.50	2.67	9.33	3.67	5.33	4.00	4.67	4.17	1.00	11.00	1.00	6.00	1.00	5.00	
Calcium (mg/L)	Apr-00	--	53.00	--	32.00	--	35.00	--	48.00	--	52.00	--	45.67	--	46.33	--	53.67	--	--	--	53.00	--	47.00	--	42.00
	May-00	57.90	66.83	57.90	49.77	57.90	50.00	57.90	63.60	57.90	71.00	57.90	57.60	57.90	50.37	57.90	64.33	57.90	--	57.90	52.50	57.90	50.00	57.90	40.50
	Jun-00	46.10	54.67	46.27	46.07	45.20	43.20	46.30	50.20	43.60	50.40	45.97	46.17	46.83	41.70	45.37	55.47	46.37	45.30	43.80	36.60	46.20	37.20	45.10	33.60
	Jul-00	55.60	54.43	55.60	47.87	55.60	43.60	55.60	52.50	55.60	49.90	55.60	46.47	55.60	38.87	55.60	56.17	55.60	52.27	55.60	33.30	55.60	41.00	55.60	38.00
	Aug-00	78.40	80.77	78.40	71.03	78.40	67.90	78.40	80.70	78.40	80.00	78.40	66.80	78.40	61.57	78.40	77.07	78.40	76.73	78.40	63.70	78.40	59.80	78.40	63.30
	Oct-00	97.90	83.40	95.37	77.33	97.60	74.40	98.60	84.60	95.90	88.00	95.53	78.97	95.50	69.40	98.03	79.93	96.90	89.28	96.90	78.80	98.30	69.90	96.90	71.20
Alkalinity (mg/L)	Apr-00	--	173.33	--	11																				

## Exhibit C-4

Monthly Summaries of Total Phosphorus Mass Balance Data from the Porta-PSTA Treatments, April 2000 - October 2000

Treatment	Date	TP (mg/L)		q_in (cm/d)	MB_TP (g/m <sup>2</sup> /y)		Removal		Calc_k (m/y)
		Inflow	Outflow		Inflow	Outflow	(g/m <sup>2</sup> /y)	(%)	
Monthly	Apr-00	0.038	0.020	5.31	0.743	0.392	0.351	47.26	12.69
	May-00	0.053	0.019	6.99	1.239	0.465	0.774	62.44	26.95
	Jun-00	0.028	0.020	8.99	0.898	0.644	0.254	28.25	11.34
	Jul-00	0.021	0.018	8.40	0.629	0.518	0.111	17.61	4.70
	Aug-00	0.019	0.017	8.17	0.559	0.481	0.078	13.93	3.02
	Sep-00	0.028	0.020	7.68	0.796	0.555	0.241	30.28	9.63
	Oct-00	0.017	0.016	6.22	0.374	0.353	0.021	5.58	1.40
3	Apr-00	0.039	0.018	4.34	0.635	0.273	0.362	57.03	12.80
	May-00	0.054	0.017	7.37	1.292	0.454	0.838	64.87	31.69
	Jun-00	0.028	0.017	8.94	0.903	0.548	0.355	39.28	15.73
	Jul-00	0.020	0.014	7.93	0.612	0.419	0.193	31.52	10.38
	Aug-00	0.019	0.012	8.90	0.623	0.406	0.217	34.81	13.96
	Sep-00	0.028	0.013	8.60	0.891	0.418	0.472	53.04	23.68
	Oct-00	0.016	0.010	8.95	0.539	0.320	0.219	40.69	17.13
4	Apr-00	0.036	0.018	5.19	0.674	0.336	0.338	50.16	13.09
	May-00	0.055	0.018	7.68	1.518	0.512	1.006	66.27	31.77
	Jun-00	0.028	0.015	8.35	0.823	0.443	0.381	46.25	19.69
	Jul-00	0.020	0.011	8.87	0.657	0.367	0.290	44.14	18.33
	Aug-00	0.019	0.011	8.37	0.585	0.347	0.238	40.68	16.14
	Sep-00	0.028	0.021	7.48	0.760	0.541	0.219	28.86	8.18
	Oct-00	0.016	0.010	8.10	0.473	0.296	0.177	37.50	13.90
7	Apr-00	0.037	0.023	5.37	0.724	0.442	0.282	38.97	9.71
	May-00	0.055	0.023	6.78	1.237	0.584	0.653	52.80	21.43
	Jun-00	0.028	0.022	9.15	0.932	0.730	0.202	21.63	8.04
	Jul-00	0.020	0.020	8.56	0.605	0.576	0.030	4.89	0.91
	Aug-00	0.019	0.013	9.53	0.663	0.463	0.200	30.12	12.47
	Sep-00	0.028	0.018	9.18	0.959	0.602	0.356	37.17	15.09
	Oct-00	0.014	0.011	13.10	0.669	0.526	0.143	21.43	11.53
11	Apr-00	0.036	0.027	5.73	0.760	0.559	0.202	26.54	6.45
	May-00	0.054	0.020	6.70	1.195	0.483	0.712	59.57	23.90
	Jun-00	0.028	0.027	9.67	0.975	0.936	0.039	3.99	1.52
	Jul-00	0.020	0.018	9.08	0.653	0.564	0.090	13.73	4.97
	Aug-00	0.019	0.017	8.17	0.559	0.470	0.089	15.94	3.94
	Sep-00	0.028	0.018	8.57	0.894	0.555	0.339	37.97	14.38
	Oct-00	0.014	0.012	8.94	0.457	0.392	0.065	14.29	5.03
12	Apr-00	0.036	0.027	5.73	0.760	0.559	0.202	26.54	6.45
	May-00	0.054	0.020	6.70	1.195	0.483	0.712	59.57	23.90
	Jun-00	0.028	0.027	9.67	0.975	0.936	0.039	3.99	1.52
	Jul-00	0.020	0.018	9.08	0.653	0.564	0.090	13.73	4.97
	Aug-00	0.019	0.017	8.17	0.559	0.470	0.089	15.94	3.94
	Sep-00	0.028	0.018	8.57	0.894	0.555	0.339	37.97	14.38
	Oct-00	0.014	0.012	8.94	0.457	0.392	0.065	14.29	5.03
13	Apr-00	0.042	0.023	5.67	0.872	0.470	0.402	46.07	12.16
	May-00	0.054	0.028	7.35	1.550	0.725	0.826	53.26	17.61
	Jun-00	0.028	0.021	8.47	0.835	0.653	0.182	21.77	8.53
	Jul-00	0.020	0.018	8.64	0.609	0.563	0.046	7.52	2.91
	Aug-00	0.020	0.012	8.62	0.608	0.367	0.241	39.62	15.18
	Sep-00	0.028	0.014	8.75	0.904	0.441	0.463	51.22	22.51
	Oct-00	0.016	0.009	9.10	0.525	0.292	0.233	44.39	20.02
14	Apr-00	0.037	0.024	5.49	0.747	0.472	0.275	36.80	9.27
	May-00	0.053	0.018	7.54	1.271	0.488	0.782	61.57	29.69
	Jun-00	0.028	0.019	8.67	0.867	0.610	0.257	29.61	11.20
	Jul-00	0.021	0.014	8.10	0.613	0.409	0.204	33.31	12.08
	Aug-00	0.019	0.013	8.71	0.602	0.414	0.188	31.22	12.88
	Sep-00	0.028	0.013	9.21	0.925	0.432	0.493	53.29	26.20
	Oct-00	0.015	0.012	9.14	0.512	0.397	0.115	22.52	9.12
15	Apr-00	0.036	0.028	4.92	0.649	0.489	0.160	24.59	4.72
	May-00	0.054	0.022	6.70	1.180	0.522	0.658	55.79	22.20
	Jun-00	0.028	0.018	8.64	0.855	0.552	0.303	35.47	13.99
	Jul-00	0.020	0.016	8.29	0.612	0.477	0.135	22.03	7.51
	Aug-00	0.019	0.012	7.40	0.524	0.327	0.197	37.60	12.03
	Sep-00	0.028	0.013	7.31	0.743	0.342	0.401	53.94	20.47
	Oct-00	0.016	0.009	8.62	0.492	0.287	0.204	41.54	16.30
16	Apr-00	--	--	--	--	--	--	--	--
	May-00	0.046	0.021	7.61	1.034	0.603	0.431	41.68	22.50
	Jun-00	0.028	0.021	16.18	1.595	1.182	0.413	25.90	17.46
	Jul-00	0.021	0.018	19.16	1.424	1.275	0.149	10.44	8.32
	Aug-00	0.019	0.013	17.68	1.251	0.838	0.413	33.04	25.46
	Sep-00	0.028	0.018	17.46	1.827	1.149	0.678	37.11	29.00
	Oct-00	0.015	0.011	17.32	0.965	0.719	0.246	25.52	19.11
17	Apr-00	0.041	0.030	5.62	0.850	0.780	0.070	8.27	6.16
	May-00	0.052	0.019	7.80	1.596	0.549	1.048	65.62	28.59
	Jun-00	0.028	0.013	8.37	0.862	0.400	0.462	53.60	22.48
	Jul-00	0.020	0.010	7.88	0.573	0.284	0.289	50.42	20.29
	Aug-00	0.019	0.009	6.63	0.455	0.213	0.241	53.06	18.87
	Sep-00	0.028	0.016	7.88	0.805	0.439	0.366	45.47	16.21
	Oct-00	0.015	0.010	8.10	0.443	0.296	0.148	33.33	11.99
18	Apr-00	0.038	0.028	5.59	0.768	0.524	0.244	31.79	6.33
	May-00	0.053	0.023	9.48	1.520	0.779	0.741	48.74	29.67
	Jun-00	0.028	0.017	8.34	0.820	0.523	0.298	36.29	14.38
	Jul-00	0.020	0.015	6.94	0.452	0.382	0.070	15.46	6.74
	Aug-00	0.019	0.012	7.70	0.548	0.323	0.225	41.05	14.23
	Sep-00	0.028	0.013	8.52	0.847	0.388	0.459	54.19	24.38
	Oct-00	0.020	0.008	8.88	0.648	0.259	0.389	60.00	29.70
19	Apr-00	0.035	0.023	6.59	0.841	0.539	0.302	35.88	10.63
	May-00	0.054	0.018	6.71	1.323	0.442	0.881	66.58	26.57
	Jun-00	0.028	0.023	9.05	0.911	0.748	0.162	17.83	6.46
	Jul-00	0.020	0.014	8.93	0.593	0.434	0.159	26.76	12.16
	Aug-00	0.019	0.010	7.92	0.532	0.291	0.241	45.27	19.41
	Sep-00	0.028	0.010	7.96	0.844	0.280	0.564	66.86	31.52
	Oct-00	0.015	0.007	9.48	0.519	0.242	0.277	53.33	26.37

**Exhibit C-5**

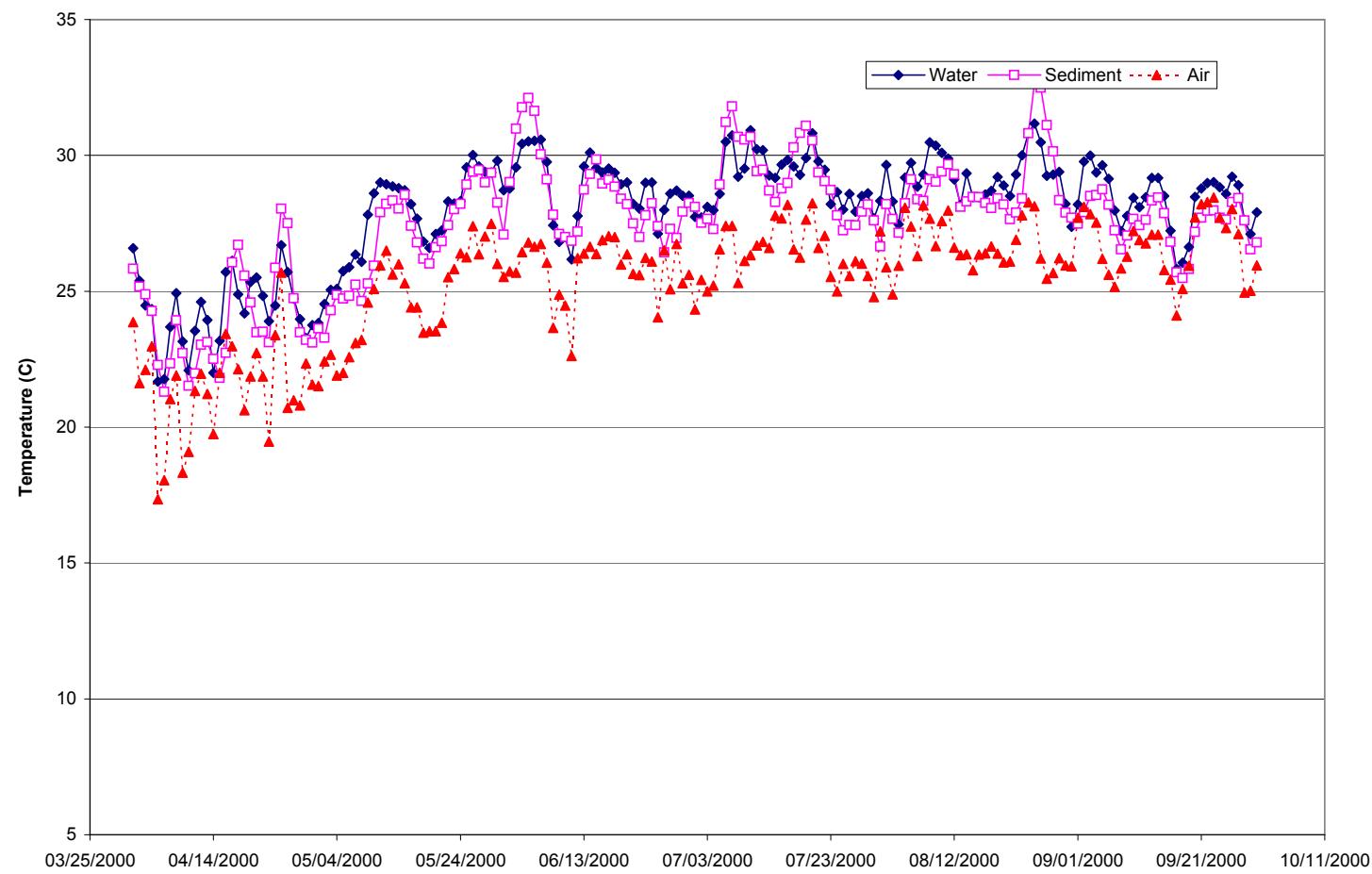
Monthly Summaries of Total Nitrogen Mass Balance Data from the Porta-PSTA Treatments, April 2000 - October 2001

Treatment	Date	TN (mg/L)		q_in (cm/d)	MB_TN (g/m <sup>2</sup> /y)		Removal		Calc_k (m/y)
		Inflow	Outflow		Inflow	Outflow	(g/m <sup>2</sup> /y)	(%)	
<b>Monthly</b>									
3	Apr-00	1.78	0.42	5.53	35.92	8.57	27.35	76.14	28.98
	May-00	1.82	2.00	7.36	48.89	53.72	-4.83	-9.87	-2.49
	Jun-00	2.47	2.29	9.40	84.73	78.45	6.28	7.41	2.65
	Jul-00	2.36	2.68	8.52	73.39	82.85	-9.46	-12.89	-3.99
	Aug-00	2.04	2.61	8.26	61.50	78.49	-16.98	-27.61	-7.47
	Oct-00	1.64	2.42	6.22	37.85	55.12	-17.27	-45.62	-8.80
4	Apr-00	1.78	1.58	5.52	35.86	31.85	4.02	11.20	2.36
	May-00	1.82	2.15	8.13	54.03	63.61	-9.58	-17.73	-4.99
	Jun-00	2.37	2.53	9.06	78.34	83.82	-5.48	-7.00	-2.16
	Jul-00	2.36	2.62	8.38	72.19	80.04	-7.86	-10.89	-3.16
	Aug-00	2.04	2.11	8.42	62.70	64.70	-2.01	-3.20	-0.99
	Oct-00	2.08	2.03	8.95	67.46	65.72	1.74	2.58	0.74
7	Apr-00	1.78	1.70	6.52	42.36	40.46	1.90	4.49	1.09
	May-00	1.82	2.09	7.60	50.49	57.98	-7.49	-14.84	-3.84
	Jun-00	2.15	3.89	8.68	68.12	123.24	-55.13	-80.93	-18.79
	Jul-00	2.36	2.65	8.34	71.84	80.67	-8.83	-12.29	-3.53
	Aug-00	2.04	2.75	6.18	46.02	62.03	-16.02	-34.80	-6.74
	Oct-00	0.62	2.32	8.10	18.33	68.59	-50.26	-274.19	-39.01
11	Apr-00	1.78	0.51	5.95	38.64	11.07	27.57	71.35	27.13
	May-00	1.82	2.28	5.84	38.80	48.60	-9.81	-25.27	-4.80
	Jun-00	2.45	2.46	9.47	84.66	85.00	-0.35	-0.41	-0.14
	Jul-00	2.36	2.92	7.72	66.50	82.28	-15.78	-23.73	-6.00
	Aug-00	2.04	2.47	9.46	70.44	85.29	-14.85	-21.08	-6.60
	Oct-00	2.45	2.37	13.10	117.15	113.32	3.83	3.27	1.59
12	Apr-00	1.78	0.66	6.03	39.16	14.52	24.64	62.92	21.82
	May-00	1.82	1.80	6.11	40.57	40.12	0.45	1.10	0.25
	Jun-00	2.46	2.41	9.67	86.80	85.03	1.76	2.03	0.72
	Jul-00	2.36	2.35	8.56	73.74	73.42	0.31	0.42	0.13
	Aug-00	2.04	2.41	8.78	65.38	77.23	-11.86	-18.14	-5.34
	Oct-00	1.32	2.26	8.94	43.07	73.75	-30.67	-71.21	-17.55
13	Apr-00	1.78	1.02	5.95	38.64	21.88	16.76	43.37	12.16
	May-00	1.82	2.60	7.95	52.79	75.34	-22.56	-42.73	-10.31
	Jun-00	2.33	2.29	9.19	77.97	76.72	1.25	1.61	0.58
	Jul-00	2.36	2.59	9.58	82.52	90.69	-8.17	-9.90	-3.30
	Aug-00	2.04	2.28	9.74	72.52	80.70	-8.17	-11.27	-3.95
	Oct-00	1.73	2.19	9.10	59.38	72.79	-13.41	-22.59	-7.82
14	Apr-00	1.78	0.43	5.59	36.33	8.71	27.62	76.03	29.15
	May-00	1.82	1.78	8.19	54.38	51.51	2.88	5.29	0.66
	Jun-00	2.38	2.08	8.68	75.31	65.69	9.62	12.78	4.27
	Jul-00	2.36	2.43	5.98	51.51	53.08	-1.57	-3.04	-0.64
	Aug-00	2.04	1.97	8.40	62.55	60.14	2.41	3.86	1.07
	Oct-00	2.39	1.43	9.14	79.48	46.24	33.24	41.82	17.17
15	Apr-00	1.78	0.73	4.63	30.06	12.55	17.51	58.26	15.13
	May-00	1.82	2.29	7.63	50.66	63.29	-12.62	-24.92	-6.44
	Jun-00	2.39	2.56	8.88	77.77	83.00	-5.23	-6.73	-2.22
	Jul-00	2.36	2.70	8.30	71.50	80.84	-9.34	-13.07	-4.08
	Aug-00	2.04	2.29	7.90	58.82	65.13	-6.30	-10.71	-3.33
	Oct-00	1.45	2.07	8.62	47.26	64.66	-17.39	-36.80	-11.18
16	Apr-00	--	--	--	--	--	--	--	--
	May-00	--	--	--	--	--	--	--	--
	Jun-00	2.42	2.35	19.47	172.18	166.83	5.35	3.11	2.28
	Jul-00	2.36	2.56	18.92	162.98	177.16	-14.18	-8.70	-5.71
	Aug-00	2.04	2.19	18.50	137.75	147.32	-9.57	-6.95	-4.79
	Oct-00	1.97	2.24	17.32	130.17	141.07	-10.90	-8.38	-8.03
17	Apr-00	1.78	0.64	7.12	46.26	16.63	29.63	64.04	26.58
	May-00	1.82	1.86	8.16	54.21	55.40	-1.19	-2.20	-0.65
	Jun-00	2.36	2.35	6.52	56.16	55.93	0.24	0.42	0.10
	Jul-00	2.36	2.60	7.80	67.19	74.02	-6.83	-10.17	-2.76
	Aug-00	2.04	2.64	5.46	40.66	52.61	-11.96	-29.41	-5.14
	Oct-00	2.36	2.29	8.10	69.77	67.70	2.07	2.97	0.89
18	Apr-00	1.78	0.55	7.16	46.52	14.37	32.14	69.10	30.69
	May-00	1.82	1.91	18.56	123.29	129.39	-6.10	-4.95	-3.27
	Jun-00	5.65	2.48	9.24	190.55	83.64	106.91	56.11	27.77
	Jul-00	2.36	2.56	7.50	64.61	70.08	-5.47	-8.47	-2.23
	Aug-00	2.04	2.26	7.32	54.50	60.38	-5.88	-10.78	-2.74
	Oct-00	2.17	2.28	8.88	70.33	73.90	-3.57	-5.07	-1.60
19	Apr-00	1.78	1.41	6.76	43.92	34.79	9.13	20.79	5.75
	May-00	1.82	2.04	7.32	48.63	54.50	-5.88	-12.09	-3.05
	Jun-00	2.39	2.44	8.96	78.16	79.80	-1.64	-2.09	-0.68
	Jul-00	2.36	3.43	5.58	48.07	69.86	-21.79	-45.34	-7.62
	Aug-00	2.04	2.42	7.14	53.16	63.07	-9.90	-18.63	-4.45
	Oct-00	2.38	2.25	9.48	82.35	77.85	4.50	5.46	1.94

## Exhibit C-6

Monthly Summaries of Sediment Data for the Porta-PSTA Treatments, April 2000 - October 2000

Treatment	Date	Density (g/cm <sup>3</sup> )	Solids (%)	Bulk Den (g/cm <sup>3</sup> )	Vol Solids (%)	TP (mg/kg)	TIP (mg/kg)	TKN (mg/kg)	TOC (mg/kg)
<b>Monthly</b>									
3	Apr-00	1.30	17.67	0.22	--	100.6	90.7	--	--
	May-00	0.73	27.77	0.20	--	159.5	132.3	--	--
	Jun-00	0.38	24.50	0.09	--	81.3	95.8	9483.3	273.3
	Jul-00	0.43	26.63	0.11	--	72.2	80.5	--	--
	Aug-00	0.49	24.23	0.12	--	160.0	101.7	--	--
	Oct-00	0.38	31.45	0.12	--	222.5	98.4	255.3	157.5
4	Apr-00	2.03	71.33	1.45	--	975.6	1043.4	--	--
	May-00	1.69	79.53	1.35	--	955.3	930.9	--	--
	Jun-00	1.59	79.70	1.27	--	934.3	1066.7	58.4	49.3
	Jul-00	1.44	80.77	1.16	--	1096.0	1099.0	--	--
	Aug-00	1.51	81.32	1.22	--	620.5	610.8	--	--
	Oct-00	1.73	82.23	1.42	--	1046.1	1021.6	69.7	41.3
7	Apr-00	2.10	73.00	1.53	--	59.6	10.7	--	--
	May-00	1.56	79.10	1.23	--	16.0	8.7	--	--
	Jun-00	1.51	79.00	1.19	--	12.6	1.8	25.0	18.0
	Jul-00	1.40	77.00	1.08	--	21.2	5.7	--	--
	Aug-00	1.43	80.40	1.15	--	10.0	9.0	--	--
	Oct-00	1.58	81.00	1.28	--	43.4	10.5	20.3	
11	Apr-00	2.00	72.00	1.44	--	942.1	1023.7	--	--
	May-00	1.25	20.80	0.26	--	865.5	876.2	--	--
	Jun-00	1.65	56.00	0.92	--	894.0	946.0	25.0	53.0
	Jul-00	1.58	82.30	1.30	--	820.0	880.0	--	--
	Aug-00	1.70	74.30	1.26	--	490.0	454.0	--	--
	Oct-00	1.71	84.10	1.44	--	1078.6	1018.3	119.0	56.0
12	Apr-00	1.10	21.00	0.23	--	116.7	110.7	--	--
	May-00	1.07	34.60	0.37	--	157.0	6840.0	6840.0	310.0
	Jun-00	0.33	35.00	0.12	--	103.0	136.0	--	--
	Jul-00	0.37	38.80	0.14	--	130.0	103.0	--	--
	Aug-00	0.62	36.60	0.23	--	195.3	103.5	1280.0	210.0
	Oct-00	0.46	35.90	0.17	--				
13	Apr-00	1.43	27.33	0.42	--	162.0	102.0	--	--
	May-00	0.86	38.27	0.33	--	83.8	90.2	--	--
	Jun-00	0.49	43.03	0.21	--	70.5	86.3	3150.0	266.7
	Jul-00	0.46	39.50	0.18	--	87.8	93.1	--	--
	Aug-00	0.51	28.07	0.15	--	130.3	73.7	--	--
	Oct-00	0.60	45.57	0.27	--	141.2	98.5	4258.7	159.0
14	Apr-00	--	--	--	--	--	--	--	--
	May-00	0.97	31.70	0.31	--	--	--	--	--
	Jun-00	--	--	--	--	--	--	--	--
	Jul-00	--	--	--	--	--	--	--	--
	Aug-00	--	--	--	--	--	--	--	--
	Oct-00	--	--	--	--	--	--	--	--
15	Apr-00	1.93	66.67	1.29	--	946.1	980.7	--	--
	May-00	1.29	19.53	0.25	--	888.0	954.6	--	--
	Jun-00	1.59	80.87	1.28	--	954.3	1143.3	36.7	58.7
	Jul-00	1.70	81.43	1.39	--	921.5	1006.5	--	--
	Aug-00	1.68	76.90	1.29	--	747.0	773.0	--	--
	Oct-00	1.74	82.83	1.44	--	1061.1	1057.5	102.3	50.3
16	Apr-00	2.03	70.00	1.42	--	921.1	1008.2	--	--
	May-00	1.74	77.60	1.35	--	930.7	945.2	--	--
	Jun-00	1.69	78.50	1.33	--	827.3	986.7	38.0	42.7
	Jul-00	1.70	80.43	1.37	--	1016.7	1032.3	--	--
	Aug-00	1.44	83.12	1.20	--	599.7	697.3	--	--
	Oct-00	1.64	82.72	1.36	--	987.0	966.1	45.7	30.0
17	Apr-00	1.90	61.00	1.16	--	25.0	10.7	--	--
	May-00	1.23	17.50	0.22	--	18.2	17.0	--	--
	Jun-00	1.45	76.80	1.11	--	12.6	6.5	25.0	14.0
	Jul-00	1.36	79.70	1.08	--	15.0	5.1	--	--
	Aug-00	1.42	80.90	1.15	--	8.0	6.0	--	--
	Oct-00	1.60	82.10	1.31	--	44.0	11.4	7.9	10.0
18	Apr-00	--	--	--	--	--	--	--	--
	May-00	--	--	--	--	--	--	--	--
	Jun-00	--	--	--	--	--	--	--	--
	Jul-00	--	--	--	--	--	--	--	--
	Aug-00	--	--	--	--	--	--	--	--
	Oct-00	--	--	--	--	--	--	--	--
19	Apr-00	--	--	--	--	--	--	--	--
	May-00	--	--	--	--	--	--	--	--
	Jun-00	--	--	--	--	--	--	--	--
	Jul-00	--	--	--	--	--	--	--	--
	Aug-00	--	--	--	--	--	--	--	--
	Oct-00	--	--	--	--	--	--	--	--



**Exhibit C-7**  
Daily Average Temperatures in the Air, Water and Sediments of the Porta-PSTA Treatments, April 2000 - October 2000

**Exhibit C-8**

Non-Reactive Phosphorus Data Summary for Porta-PSTA Sediments, April 2000 - October 2000

Treatmentt	Soil	Date	Moisture %	TP mg/kg	NaHCO <sub>3</sub> Pi mg/kg	NaHCO <sub>3</sub> TP mg/kg	Labile Po mg/kg	HClPi mg/kg	Alkali Hydrolyz Po (NaOH TP) mg/kg	Residual Po mg/kg
3	PE	06/20/2000	62.77	273.9	4.06	8.72	4.65	96.7	8.2	24.9
		10/04/2000	68.07	137.9	2.61	9.63	7.02	74.8	9.2	35.8
4	SR	06/20/2000	19.55	1012.4	3.08	2.94	-0.14	929.4	-26.1	40.1
		10/03/2000	22.11	979.2	1.71	1.90	0.19	921.7	-30.5	47.5
7	SA	06/20/2000	20.11	38.7	0.49	1.24	0.75	11.1	0.6	6.5
		10/04/2000	23.64	28.2	0.67	0.86	0.20	2.5	1.1	8.1
11	SR	06/21/2000	18.89	888.3	2.75	2.50	-0.25	828.6	-42.6	48.5
		10/03/2000	21.81	1106.5	2.27	1.64	-0.64	952.3	-37.0	46.2
12	PE	06/21/2000	67.96	135.7	2.65	10.23	7.58	129.4	18.1	32.6
		10/04/2000	70.23	179.3	3.30	10.46	7.16	116.0	17.0	37.1
13	PE_limed	06/20/2000	51.45	86.9	1.59	4.30	2.71	58.5	-0.2	23.5
		10/04/2000	73.83	151.9	2.17	12.71	10.54	81.9	19.7	38.9
15	SR	06/21/2000	19.96	992.8	2.93	2.68	-0.25	978.9	-26.7	38.8
		10/04/2000	17.34	957.6	3.21	2.22	-0.99	968.6	-33.2	44.1
16	SR	06/21/2000	17.57	960.7	3.28	2.77	-0.51	1004.6	-33.0	40.4
		10/03/2000	20.19	1036.3	2.56	1.44	-1.11	979.6	-28.0	41.3
17	SA_HCl	06/21/2000	21.25	28.9	2.64	2.07	-0.57	28.2	0.9	7.7
		10/04/2000	18.55	31.4	1.85	1.09	-0.77	3.8	3.1	9.0

## Exhibit C-9

Summary of Sediment Trap Data from the Porta-PSTA Mesocosms During Phase 2 Research Period (April - October 2000). Values are Averages of All Replicates Within a Treatment.

Treatment	Soil	Wet Accretion (ml/m <sup>2</sup> /y)	Dry Accretion (g/m <sup>2</sup> /y)	TP Accretion (g/m <sup>2</sup> /y)	Wet Bulk Density (g/cm <sup>3</sup> )	Dry Bulk Density (g/cm <sup>3</sup> )	Wet Weight (g)	Dry Weight (g)	Moisture Content (%)	TP (mg/kg)	Ash (%)
PP-3	PE	21614	799	0.393	1.694	0.028	91.44	2.33	98.16	566.7	31.30
PP-4	SR	45622	2722	1.218	1.009	0.077	91.01	7.65	92.15	449.1	74.34
PP-7	SA	69528	1879	0.264	1.329	0.034	134.02	5.42	96.34	90.0	73.45
PP-11	SR	37410	948	0.368	2.161	0.043	64.25	2.78	96.39	428.0	65.20
PP-12	PE	14559	270	0.190	1.443	0.017	55.96	0.74	98.77	697.1	31.88
PP-13	PE (limed)	114612	1485	0.556	0.474	0.020	135.51	4.45	96.31	393.8	61.09
PP-14	LR	13130	262	0.069	1.160	0.023	23.87	0.79	97.08	299.9	64.51
PP-15	SR	59019	1635	0.980	1.120	0.038	127.62	4.67	96.31	638.1	64.46
PP-16	SR	70548	1728	0.841	0.713	0.044	98.34	5.18	94.22	490.4	72.51
PP-17	SA (HCl)	78448	2684	0.427	0.451	0.034	106.08	8.04	92.42	159.0	77.34
PP-18	none	123514	1529	0.378	0.339	0.012	125.58	4.58	96.35	247.3	63.68
PP-19	none	93470	2467	0.465	0.567	0.026	158.70	7.39	95.34	188.4	66.52

**Notes:**Sample Area = 154 cm<sup>2</sup> (14.0 cm diameter)

ND = not determined

Assume BD = 0.05 g/cm<sup>3</sup> when not determined

Assume TP = 0.05% when not determined

**Exhibit C-10**

Monthly Summaries of Algae and Macrophyte Percent Cover and Stem Count Estimates in the Porta-PSTA Treatments, April 2000 – October 2000

Treatment	Date	Blue-Green Algal Mat	Green Algal Mat	Emergent Macrophytes	Floating Aquatic Plants	Submerged Aquatic Plants	Algal Mat % Cover	Macrophyte % Cover	Total % Cover	No. Stems/m <sup>2</sup>
<b>Monthly</b>										
3	Apr-00	2%	2%	69%	0%	2%	4%	71%	74%	537
	May-00	9%	0%	63%	0%	4%	9%	67%	75%	436
	Jun-00	13%	0%	64%	0%	0%	13%	65%	77%	560
	Jul-00	10%	0%	54%	0%	0%	10%	54%	64%	446
	Aug-00	5%	0%	51%	0%	1%	5%	52%	57%	359
	Oct-00	2%	0%	69%	0%	3%	2%	72%	74%	315
4	Apr-00	28%	0%	5%	0%	1%	28%	6%	33%	67
	May-00	36%	0%	6%	0%	2%	36%	8%	44%	88
	Jun-00	39%	0%	6%	0%	3%	39%	8%	47%	126
	Jul-00	16%	0%	12%	0%	2%	16%	13%	29%	137
	Aug-00	7%	0%	11%	0%	6%	7%	18%	24%	161
	Oct-00	7%	0%	14%	0%	6%	7%	20%	27%	117
3	Apr-00	46%	0%	3%	0%	0%	46%	3%	49%	25
	May-00	63%	0%	3%	0%	0%	63%	3%	66%	24
	Jun-00	68%	0%	3%	0%	0%	68%	3%	71%	61
	Jul-00	63%	0%	3%	0%	0%	63%	3%	66%	72
	Aug-00	38%	0%	5%	0%	0%	38%	5%	42%	105
	Oct-00	21%	0%	8%	0%	0%	21%	8%	28%	105
11	Apr-00	5%	0%	5%	0%	0%	5%	5%	9%	215
	May-00	8%	0%	8%	0%	0%	8%	8%	15%	117
	Jun-00	6%	0%	14%	0%	0%	6%	14%	20%	272
	Jul-00	5%	0%	31%	0%	0%	5%	31%	35%	757
	Aug-00	6%	0%	54%	0%	0%	6%	54%	60%	319
	Oct-00	3%	0%	63%	0%	3%	3%	65%	68%	304
12	Apr-00	1%	0%	73%	0%	0%	1%	73%	73%	471
	May-00	1%	0%	44%	0%	0%	1%	44%	45%	299
	Jun-00	0%	0%	63%	0%	0%	0%	63%	63%	331
	Jul-00	0%	0%	83%	0%	0%	0%	83%	83%	1072
	Aug-00	1%	0%	83%	0%	0%	1%	83%	83%	385
	Oct-00	0%	0%	89%	0%	0%	0%	89%	89%	384
13	Apr-00	0%	0%	1%	0%	0%	0%	1%	1%	2
	May-00	0%	0%	1%	0%	0%	0%	1%	1%	3
	Jun-00	1%	0%	1%	0%	4%	1%	5%	6%	15
	Jul-00	11%	0%	3%	0%	10%	11%	13%	24%	31
	Aug-00	26%	0%	6%	0%	26%	26%	32%	58%	99
	Oct-00	0%	34%	14%	0%	38%	34%	52%	86%	138
14	Apr-00	0%	0%	2%	0%	0%	0%	2%	2%	5
	May-00	0%	0%	3%	0%	0%	0%	3%	3%	10
	Jun-00	20%	0%	2%	0%	0%	20%	2%	23%	20
	Jul-00	13%	0%	3%	0%	0%	13%	3%	16%	21
	Aug-00	5%	0%	3%	0%	0%	5%	3%	8%	40
	Oct-00	8%	0%	3%	0%	0%	8%	3%	11%	17
15	Apr-00	0%	1%	9%	0%	0%	1%	9%	10%	96
	May-00	6%	2%	10%	0%	0%	8%	10%	18%	241
	Jun-00	21%	0%	25%	0%	1%	21%	27%	47%	331
	Jul-00	1%	0%	42%	0%	3%	1%	45%	46%	287
	Aug-00	7%	0%	42%	0%	14%	7%	56%	63%	239
	Oct-00	28%	0%	51%	0%	16%	29%	67%	96%	263
16	Apr-00	89%	0%	5%	0%	0%	89%	5%	94%	196
	May-00	0%	0%	5%	0%	0%	0%	5%	5%	153
	Jun-00	1%	0%	6%	0%	0%	1%	6%	7%	136
	Jul-00	3%	0%	8%	0%	0%	3%	9%	12%	167
	Aug-00	16%	0%	14%	0%	1%	16%	15%	31%	81
	Oct-00	13%	0%	9%	0%	1%	13%	10%	24%	121
17	Apr-00	1%	0%	3%	0%	0%	1%	3%	4%	8
	May-00	2%	3%	3%	0%	0%	5%	3%	8%	16
	Jun-00	76%	0%	2%	0%	0%	76%	2%	78%	32
	Jul-00	74%	0%	3%	0%	0%	74%	3%	77%	47
	Aug-00	54%	0%	3%	0%	0%	54%	3%	57%	62
	Oct-00	31%	0%	3%	0%	1%	31%	4%	35%	58
18	Apr-00	5%	0%	0%	0%	0%	5%	0%	5%	0
	May-00	14%	0%	0%	0%	0%	14%	0%	14%	0
	Jun-00	51%	0%	0%	0%	0%	51%	0%	51%	0
	Jul-00	28%	0%	0%	0%	0%	28%	0%	28%	0
	Aug-00	63%	0%	0%	0%	0%	63%	0%	63%	0
	Oct-00	46%	0%	0%	0%	0%	46%	0%	46%	0
19	Apr-00	3%	0%	0%	0%	0%	3%	0%	3%	0
	May-00	3%	6%	0%	0%	0%	9%	0%	9%	0
	Jun-00	--	--	--	--	--	--	--	--	--
	Jul-00	16%	0%	0%	0%	0%	16%	0%	16%	0
	Aug-00	46%	0%	0%	0%	0%	46%	0%	46%	0
	Oct-00	46%	0%	0%	0%	0%	46%	0%	46%	0

Final Porta-PSTA sampling postponed until October due to electrical failure at ENR site.

## Exhibit C-11

Monthly Summaries of Periphyton Data from the Porta-PSTA Treatments, April 2000 - October 2000

Treatment	Date	Periphyton Biomass (g/m <sup>2</sup> )			Ca (g/m <sup>2</sup> )	Chl_a (corr) (mg/m <sup>2</sup> )	Pheo_a (mg/m <sup>2</sup> )	TP (g/m <sup>2</sup> )	TIP (g/m <sup>2</sup> )	TKN (g/m <sup>2</sup> )	Blue Green Algae		Diatoms		Green Algae		Other Taxa		Total Taxa		Biovolume (cm <sup>3</sup> /m <sup>2</sup> )	Evenness	SWDI
		Dry Wt	Ash Wt	AFDW							(# cells/m <sup>2</sup> ) * 10 <sup>6</sup>	(# taxa)	(# cells/m <sup>2</sup> ) * 10 <sup>6</sup>	(# taxa)	(# cells/m <sup>2</sup> ) * 10 <sup>6</sup>	(# taxa)	(# cells/m <sup>2</sup> ) * 10 <sup>6</sup>	(# taxa)	(# cells/m <sup>2</sup> ) * 10 <sup>6</sup>	(# taxa)			
3	Apr-00	1466.0	505.7	960.3	124.8	105.8	10.8	1.198	0.239	--	119296.5	14.0	3860.5	9.0	2944.9	6.7	40.5	0.3	126142.4	30.0	13.40	0.639	3.14
	May-00	368.2	200.7	167.4	39.1	95.1	7.7	0.155	0.053	--	68874.2	15.7	2473.9	11.3	1702.3	8.0	15.7	0.7	73066.1	35.7	21.90	0.758	3.88
	Jun-00	656.8	290.2	366.7	76.5	218.5	41.5	0.160	0.103	6.94	230310.3	10.7	2491.4	8.7	1438.4	4.3	0.0	0.0	234240.0	23.7	12.72	0.660	2.97
	Jul-00	699.6	352.9	346.7	47.8	118.5	29.3	0.436	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Aug-00	631.8	302.0	329.9	36.1	224.1	122.6	0.161	0.256	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-00	580.4	226.5	353.9	39.5	233.5	97.8	0.370	0.050	15.21	104046.0	8.0	2386.1	8.7	1783.5	4.3	0.0	0.0	108215.5	21.0	5.24	0.651	2.85
4	Apr-00	428.0	532.8	116.0	224.5	186.1	28.6	0.495	0.098	--	283272.5	16.3	9342.0	8.3	854.1	1.7	0.0	0.0	293468.5	26.3	16.42	0.747	3.52
	May-00	695.9	543.8	152.1	120.4	214.7	0.1	0.499	0.250	--	486757.3	10.3	13806.3	7.3	2236.2	2.0	0.0	0.0	502799.7	19.7	27.62	0.640	2.75
	Jun-00	495.6	395.1	100.5	133.9	105.4	0.1	0.122	0.131	1.68	184577.4	17.0	4690.1	9.3	1622.1	5.3	0.0	0.0	141273.0	31.7	9.35	0.674	3.36
	Jul-00	1176.0	981.0	194.3	268.9	188.7	5.4	0.255	0.237	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Aug-00	352.8	284.1	68.7	46.9	66.0	11.4	0.107	0.124	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-00	357.8	271.9	85.9	83.6	160.0	21.7	0.201	0.125	2.81	126930.7	15.3	1558.0	6.0	1991.5	3.0	78.9	0.3	130559.1	24.7	7.48	0.680	3.14
7	Apr-00	430.4	333.0	97.4	110.0	7.4	7.0	0.151	0.016	--	485219.5	12.0	14569.5	10.0	--	0.0	0.0	0.0	499789.0	22.0	38.51	0.691	3.08
	May-00	122.2	85.2	37.2	34.4	70.8	0.0	0.046	0.018	--	155377.8	18.0	3487.2	12.0	1937.3	3.0	129.1	1.0	160931.4	34.0	12.78	0.736	3.75
	Jun-00	1173.7	955.4	218.4	175.6	310.3	0.0	0.141	0.059	0.63	1210727.9	15.0	13207.9	6.0	2935.1	1.0	0.0	0.0	1226870.9	22.0	28.94	0.691	3.08
	Jul-00	1074.6	891.3	183.2	117.9	149.3	5.0	0.084	0.065	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Aug-00	1422.9	1145.0	277.9	137.8	249.6	1.9	0.013	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-00	743.9	600.7	143.2	137.0	157.8	29.5	0.174	0.013	2.98	505714.1	15.0	3924.8	5.0	2803.3	2.0	0.0	0.0	512442.2	22.0	40.02	0.767	3.42
11	Apr-00	1602.7	1383.1	219.5	248.8	164.7	0.0	1.804	0.173	--	521117.6	13.0	16524.8	7.0	9442.8	8.0	0.0	0.0	547085.2	28.0	29.28	0.658	3.16
	May-00	2009.5	1629.1	380.4	280.3	333.3	0.0	1.109	0.594	--	968322.7	23.0	16005.7	10.0	12671.0	6.0	0.0	0.0	996994.9	39.0	40.54	0.713	3.77
	Jun-00	295.9	207.1	88.9	73.8	119.1	0.0	0.099	0.039	1.43	217832.9	19.0	2060.5	3.0	883.1	3.0	0.0	0.0	220776.4	25.0	10.30	0.699	3.25
	Jul-00	818.0	602.2	215.8	172.5	218.7	5.9	0.320	0.220	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Aug-00	198.4	127.2	71.2	25.7	174.7	1.3	0.181	0.244	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-00	532.1	433.7	98.4	134.4	205.8	12.2	0.123	0.027	6.28	107450.0	18.0	1391.1	7.0	945.8	7.0	0.0	0.0	109787.0	32.0	6.36	0.661	3.31
12	Apr-00	1115.7	478.1	636.1	99.1	45.3	17.3	0.506	0.090	--	46483.9	8.0	2828.4	13.0	2618.3	8.0	0.0	0.0	51930.6	29.0	3.47	0.645	3.13
	May-00	115.7	68.9	46.8	10.3	23.4	0.1	0.035	0.011	--	13500.5	14.0	490.8	10.0	454.1	9.0	0.0	0.0	14445.4	33.0	5.28	0.634	3.20
	Jun-00	247.8	493.5	245.8	42.1	122.4	55.9	0.096	0.053	4.34	21737.2	8.0	2246.6	8.0	660.7	4.0	0.0	0.0	24644.5	20.0	7.61	0.631	2.73
	Jul-00	1241.9	512.2	729.7	79.6	243.8	35.1	0.523	0.240	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Aug-00	500.1	300.4	199.7	39.0	63.6	34.7	0.698	0.310	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-00	441.4	217.7	223.8	30.7	117.8	87.7	0.41															

## EXHIBIT C-12

Non-Reactive Phosphorus Data Summary for Porta-PSTA Periphyton, April 2000 - October 2000

Treatment	Soil	Date	Moisture %	TP mg/kg	NaHCO <sub>3</sub> Pi mg/kg	NaHCO <sub>3</sub> TP mg/kg	Labile Po mg/kg	HClPi mg/kg	Alkali Hydrolyz Po (NaOH TP) mg/kg	Residual Po mg/kg
3	PE	06/20/2000	96.69	315.0	2.58	149.67	147.09	227.5	-1.2	43.2
		10/04/2000	95.91	331.6	2.77	182.68	179.91	57.2	28.4	45.3
4	SR	06/20/2000	90.56	467.6	1.71	54.46	52.75	275.2	0.7	29.2
		10/03/2000	94.02	298.5	2.73	124.62	121.89	125.0	20.4	51.9
7	SA	06/20/2000	94.90	208.2	1.63	90.73	89.10	167.3	3.8	30.6
		10/04/2000	92.65	147.9	2.07	54.32	52.25	20.2	20.3	27.2
11	SR	06/21/2000	93.44	300.5	2.24	105.72	103.48	142.2	6.5	39.7
		10/03/2000	93.51	675.8	2.58	179.78	177.21	623.5	3.3	85.1
13	PE_limed	06/20/2000	89.34	212.3	1.39	57.46	56.07	174.3	14.1	26.6
		10/04/2000	94.03	342.0	2.32	135.23	132.92	92.4	26.1	60.6
14	LR	06/20/2000	95.20	187.8	1.69	79.72	78.03	135.6	-0.5	27.1
		10/03/2000	93.54	522.3	2.23	165.81	163.58	307.3	14.8	65.7
15	SR	06/21/2000	94.94	471.3	2.35	194.03	191.68	209.1	20.4	51.7
		10/04/2000	93.76	567.2	2.45	212.66	210.21	262.4	30.2	84.6
16	SR	06/21/2000	85.07	535.8	1.63	48.21	46.58	421.2	4.5	40.7
		10/03/2000	94.60	169.3	2.60	67.74	65.14	34.2	39.6	29.4
17	SA_HCl	06/21/2000	84.35	18.0	1.52	36.90	35.38	67.2	5.8	19.5
		10/04/2000	91.93	161.6	3.80	70.21	66.41	27.8	16.6	39.4
18	none	06/21/2000	94.12	71.5	2.18	71.55	69.37	105.0	6.6	26.8
		10/03/2000	95.34	169.5	2.54	77.53	74.99	86.0	8.7	39.5
19	none	06/21/2000	94.48	168.5	2.19	66.26	64.07	181.6	-2.6	29.1
		10/03/2000	95.07	300.3	1.83	107.34	105.51	207.3	11.9	50.4

## EXHIBIT C-13

Summary of Macrophyte Biomass Data for the Porta-PSTA Treatments, April 2000 - October 2000

Month	Treatment (Porta-PSTA Mesocosm)																				
	3			4			7	11	12	13			14		15			16			17
	12	14	17	3	5	10	19	23	24	9	11	18	4	8	2	13	16	1	6	15	20
Apr-00	438	501	154	---	160	---	---	102	857	---	---	---	---	54	21	118	128	17	96	---	
May-00	355	649	352	---	65	46	5	60	114	---	---	---	17	30	50	100	176	34	---	33	
Jun-00	451	486	253	---	89	21	114	44	314	---	---	---	19	---	83	76	365	83	---	39	8
Jul-00	627	468	247	24	80	161	---	70	420	---	14	---	---	250	---	362	---	---	39	---	
Aug-00	111	593	542	---	160	123	66	395	471	118	---	32	---	5	95	103	329	222	38	20	---
Sep-00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
Oct-00	188	674	361	234	131	86	336	266	504	163	124	318	100	49	288	375	854	137	130	83	50
<b>Cell Average</b>	<b>362</b>	<b>562</b>	<b>318</b>	<b>129</b>	<b>114</b>	<b>87</b>	<b>130</b>	<b>156</b>	<b>447</b>	<b>140</b>	<b>69</b>	<b>175</b>	<b>45</b>	<b>28</b>	<b>137</b>	<b>135</b>	<b>367</b>	<b>121</b>	<b>62</b>	<b>55</b>	<b>30</b>
<b>Treatment Average</b>	<b>414</b>			<b>106</b>			<b>130</b>	<b>156</b>	<b>447</b>		<b>128</b>		<b>37</b>		<b>218</b>			<b>82</b>		<b>30</b>	

## Notes:

All values are in units of g dry/m<sup>2</sup>

## EXHIBIT C-14

Porta-PSTA Average Algal Cell Counts (# cells/m<sup>3</sup> x 10<sup>6</sup>), April 2000 - October 2000

Organism Code	Division Code	Organism	Treatment											
			3	4	7	11	12	13	14	15	16	17	18	19
ANAB CIR	1	ANABAENOPSIS CIRCULARIS	--	--	--	--	--	4001.3529	--	1675.5865	5567.2323	--	--	--
APH DEL	1	APHANOCAPSA DELICATISSIMA	4,893	5,261	12,570	16,516	6,382	5,972	3,568	14,123	15,699	20,251	29,382	3,507
APH GRE	1	APHANOCAPSA GREVILLEI	--	21,435	--	--	273	294	--	--	--	--	--	--
APH INC	1	APHANOCAPSA INCERTA	--	--	--	--	--	2,731	5,690	25,226	16,889	--	--	--
APH NUB	1	APHANOCAPSA NUBLUM	--	--	--	--	--	--	--	2,423	94,527	--	--	--
APH PLA	1	APHANOCAPSA PLANCTONICA?	3,637	2,031	40,289	--	--	1,177	18,804	7,596	13,905	17,922	20,947	31,526
APHA CLA	1	APHANTHECE CLATHRATA	2,928	5,476	14,675	10,670	--	--	3,001	2,345	5,630	3,124	23,200	6,964
APHA SMI	1	APHANTHECE SMITHII	7,415	8,337	19,975	18,997	293	1,678	24,809	6,330	28,124	15,009	1,881	4,724
APHA STA	1	APHANTHECE STAGNINA	5,237	13,491	118,595	9,617	1,957	3,772	6,652	10,993	33,646	20,628	13,530	31,737
APHA VAR	1	APHANTHECE VARIABILIS?	--	--	--	--	--	--	--	1,743	--	--	--	--
APHN FLO	1	APHANIZOMENON FLOS-AQUAE	--	--	--	--	--	2,910	14,105	--	--	--	--	62,067
ART TEN	1	ARTHROSPIRA TENUIS?	--	39,282	--	--	--	--	--	--	88,147	--	--	--
CAL EPI	1	CALOTHRIX EPIPHYTICA	--	--	--	--	--	--	--	--	710	--	--	--
CHR DIS	1	CHROOCOCCUS DISPERSUS	1,576	6,547	6,464	10,930	1,961	1,048	2,180	3,087	1,164	3,562	23,083	524
CHR MIN	1	CHROOCOCCUS MINUTUS	406	2,103	3,364	1,746	549	420	1,484	1,076	2,854	2,958	2,257	2,580
CHR MINI	1	CHROOCOCCUS MINIMUS	2,847	5,534	13,727	7,135	1,473	3,327	2,271	7,210	13,339	22,606	32,706	6,965
CHR PLA	1	CHROOCOCCUS PLANCTONICUS	--	587	--	--	--	--	--	--	--	--	--	--
CHR TUR	1	CHROOCOCCUS TURGIDUS	316	299	--	111	147	77	1,152	358	868	--	--	2,282
COE KUE	1	COELOSPAERIUM KUETZINGIANUM	4,716	--	--	--	--	--	--	--	--	--	--	--
CYL STA	1	CYLINDROSPERMUM STAGNALE	--	--	--	--	--	--	--	--	--	--	--	--
EUC MIN	1	EUCAPSIS MINOR	--	--	--	--	--	196	--	--	--	--	--	--
G ANA	1	ANABAENA SP	6,947	4,260	--	736	--	781	3,415	4,063	4,085	6,681	--	1,832
G CYL	1	CYLINDROSPERMUM SP	11,536	12,040	12,970	3,395	--	6,915	10,885	19,516	7,573	6,549	14,865	33,729
G GLO	1	GLOEOCAPSA SP	--	1,824	14,200	258	419	600	6,689	5,020	6,019	14,383	2,299	5,911
G LYN SM	1	LYNGBYA SP (SMALL)	--	17,219	20,665	10,783	--	1,285	16,373	9,573	26,864	9,254	97,341	7,973
G OSC ME	1	OSCILLATORIA SP (MEDIUM)	--	--	--	--	--	283	--	--	35,390	--	--	--
G OSC SM	1	OSCILLATORIA SP (SMALL)	15,371	7,546	--	5,335	--	870	6,308	13,708	2,714	44,209	13,247	2,225
G SCY	1	SCYTONEMA SP?	11,263	--	14,577	1,770	--	684	5,905	2,763	12,583	--	87,458	22,053
G SYNE	1	SYNECHOCOCCUS SP	52,298	26,761	2,416	30,259	49	13,917	44,157	39,231	18,951	36,470	7,068	8,725
GLO MEM	1	GLOEOTHECE MEMBRANACEAE	--	--	--	--	--	--	--	--	--	11,018	--	--
GOM APO	1	GOMPHOSPHAERIA APONINA	3,867	3,787	--	--	4,301	--	--	15,417	2,681	--	--	--
JOH PEL	1	JOHANNESBAPTISTIA PELLUCIDA	1,876	16,400	--	4,001	4,652	--	927	5,276	6,284	1,143	588	3,712
LYN AER	1	LYNGBYA AERUGINEO-CARULEA?	20,173	15,360	27,585	41,025	--	2,937	8,125	5,612	27,836	10,768	57,128	20,828
LYN AES	1	LYNGBYA AESTUARII	29,149	5,845	--	--	--	--	--	--	--	--	--	--
LYN CON	1	LYNGBYA CONTORTA	--	--	--	17,339	--	--	--	--	--	--	--	--
LYN EPI	1	LYNGBYA EPIPHYTICA	12,661	11,991	10,135	33,956	10,888	3,175	16,236	8,383	26,833	29,603	20,700	--
LYN LAG	1	LYNGBYA LAGERHEIMII	3,804	5,873	59,455	14,242	1,345	10,243	22,037	18,681	27,246	98,603	188,080	35,194
LYN LIM	1	LYNGBYA LIMNETICA	8,068	52,930	64,165	117,938	491	3,084	64,575	26,680	110,621	97,817	148,721	124,223
LYN PER	1	LYNGBYA PERELEGANS?	--	1,467	1,550	14,211	--	--	6,609	10,049	--	--	--	30,048
LYN TAY	1	LYNGBYA TAYLORII?	--	--	--	73,358	--	--	--	--	--	--	--	--
MER DUP	1	MERISMOPEDIA DUPLEX	--	--	--	--	--	889	--	--	--	--	--	--
MER GLA	1	MERISMOPEDIA GLAUCA	1,977	407	--	2,355	98	740	5,087	2,898	710	--	--	--
MER PUN	1	MERISMOPEDIA PUNCTATA	--	10,576	--	--	--	3,711	--	--	5,908	--	--	--
MER TEN	1	MERISMOPEDIA TENUISSIMA	1,288	1,367	517	5,335	959	3,359	3,671	14,186	2,195	1,134	--	--
MIC AER	1	MICROCYSTIS AERUGINOSA	9,716	--	--	--	1,873	5,084	--	--	--	1,524	--	--
MIC FIR	1	MICROCYSTIS FIRMA	16,936	6,551	81,856	--	1,780	--	18,124	24,984	17,129	97,448	4,702	9,162
MIC FLO	1	MICROCYSTIS FLOS-AQUAE	--	--	--	--	6,015	--	--	--	--	--	--	--
MIC SMI	1	MICROCYSTIS SMITHII	--	--	--	16,532	--	466	--	--	--	106,923	--	--
OSC AMP	1	OSCILLATORIA AMPHIBIA	--	19,042	--	--	--	1,401	9,623	1,303	14,177	--	--	8,622
OSC AMPH	1	OSCILLATORIA AMPHIGRANULATA	--	--	--	--	--	--	1,181	--	--	--	--	--
OSC ANG	1	OSCILLATORIA ANGUSTISSIMA	25,705	43,067	51,467	25,208	2,775	7,178	17,343	22,336	30,560	50,477	112,566	75,771
OSC FOR	1	OSCILLATORIA FORMOSA	5,680	14,186	20,068	35,345	856	2,310	46,936	8,567	35,327	32,584	32,219	39,861

## EXHIBIT C-14

Porta-PSTA Average Algal Cell Counts (# cells/m<sup>2</sup> x 10<sup>6</sup>), April 2000 - October 2000

Organism Code	Division Code	Organism	Treatment											
			3	4	7	11	12	13	14	15	16	17	18	19
OSC LIM	1	OSCILLATORIA LIMNETICA	15,994	66,465	150,869	70,826	2,162	5,097	68,706	26,538	47,663	72,153	257,202	97,327
OSC LIMO	1	OSCILLATORIA LIMOSA	--	--	38,007	--	--	--	--	3,853	19,437	--	--	--
OSC TEN	1	OSCILLATORIA TENUIS	--	13,284	--	--	--	--	--	--	--	--	5,626	--
OSC WIL	1	OSCILLATORIA WILLEI?	--	--	--	2,671	--	--	126,374	5,604	27,872	28,342	--	--
PHO LUC	1	PHORMIDIUM LUCIDUM?	--	--	--	--	--	--	--	2,732	--	--	--	--
PHO TEN	1	PHORMIDIUM TENUE	--	2,202	--	1,766	--	--	--	6,449	26,514	--	--	--
RHA LIN	1	RHABDOODERMA LINEARE?	21,226	4,019	--	11,184	--	--	7,750	25,040	3,972	4,060	1,913	1,440
SCH ARE	1	SCHIZOTHRIX ARENARIA?	10,461	50,605	--	73,417	--	--	23,906	19,527	38,184	19,584	52,660	--
SCY HOF	1	SCYTONEEMA HOFMANII?	--	--	--	--	--	--	--	28,525	--	--	--	--
SNO LAC	1	SNOWELLA LACUSTRIS	--	2,187	--	--	--	1,802	2,791	5,410	3,197	--	--	--
SPI LAX	1	SPIRULINA LAXA	--	--	--	--	--	--	--	--	--	480	--	--
SPI MAJ	1	SPIRULINA MAJOR	--	--	--	--	--	--	470	--	--	--	--	--
SPI SUB	1	SPIRULINA SUBSALSA	933	849	927	601	--	210	1,103	1,187	685	906	2,935	1,026
ANK FAL	3	ANKISTRODESMUS FALCATUS	285	--	--	667	71	319	276	123	506	--	--	131
ANK NAN	3	ANKISTRODESMUS NANNOSELENE	197	74	561	737	117	312	112	297	66	--	--	61
ANK SPI	3	ANKISTRODESMUS SPIRALIS	159	512	2,935	365	111	209	573	464	689	--	1,614	123
CHA ENS	3	CHARACIUM ENSIFORME	--	--	--	--	--	--	6	--	--	--	--	--
CLO PAR	3	CLOSTERIUM PARVULUM	--	114	--	--	--	53	5	18	--	--	--	--
COE MIC	3	COELASTRUM MICROPORUM	--	--	--	--	--	204	4,595	--	4,611	--	--	--
COE SPH	3	COELASTRUM SPHAERICUM	1,451	1,174	--	5,335	--	665	684	2,341	--	--	--	491
COS BOT	3	COSMARIUM BOTRYTIS	--	--	--	--	--	--	--	--	412	--	--	--
COS GRAN	3	COSMARIUM GRANATUM	--	--	--	--	--	--	--	--	115	--	--	--
COS PUN	3	COSMARIUM PUNCTULATUM	--	--	--	--	--	--	15	--	590	--	--	--
COS SUBR	3	COSMARIUM SUBRENIFORME	66	114	--	590	39	86	342	491	482	95	--	131
COS TUB	3	COSMOCLADIUM TUBerculatum	--	--	--	--	--	--	--	--	--	--	--	--
CRU API	3	CRUCIGENIA APICULATA	--	947	--	--	--	204	897	--	--	--	--	--
DIC PUL	3	DICTYOSPHAERIUM PULCHELLUM	--	--	--	--	--	--	--	--	4,454	--	--	--
ELA GEL	3	ELAKATOThRIX GELATINOSA	122	--	--	--	--	--	--	--	--	--	--	--
EUA COR ME	3	EUASTRUM CORNUBIENSE V MEDIANUM	23	473	129	111	--	35	88	241	103	337	2,888	493
EUA VER	3	EUASTRUM VERRUCOSUM	--	--	--	--	--	53	--	--	--	--	--	--
G CHLA	3	CHLAMYDOMONAS SP	53	266	--	--	--	25	90	--	--	--	--	--
G COS	3	COSMARIUM SP	--	--	--	--	--	59	--	--	--	--	--	--
G GONA	3	GONATOZYGON SP	--	266	--	--	--	--	--	--	--	--	--	--
G MOU	3	MOUGEOTIA SP	--	--	--	--	--	282	--	--	--	--	--	--
G OED	3	OEDOGONIUM SP	729	1,284	1,292	--	--	164	2,388	1,056	--	--	--	--
G SPI	3	SPIROGYRA SP	--	--	--	--	--	--	--	919	1,011	--	--	--
G STAU	3	STAURASTRUM SP	--	--	--	--	12	--	--	--	--	--	--	--
GOL RAD	3	GOLENKINIA RADIATA	243	--	--	--	--	--	--	--	--	--	--	--
KIR CON	3	KIRCHNERIELLA CONTORTA	--	--	--	--	--	--	3,774	--	--	--	--	--
KIR LUN	3	KIRCHNERIELLA LUNARIS	272	73	--	--	--	70	15	195	--	--	--	--
KIR OBE	3	KIRCHNERIELLA OBESA	243	--	--	1,180	--	57	25	--	335	--	--	--
LAG SUB	3	LAGERHEIMIA SUBSALSA	--	--	--	--	--	51	--	--	--	--	--	--
MIC PIN	3	MICRASTERIAS PINNATIFIDA	118	--	--	--	--	--	--	--	--	--	--	--
OED PUN	3	OEDOGONIUM PUNCTATOSTRIATUM	118	--	--	--	--	1,698	888	895	--	3,240	9,963	2,217
OOC PAR	3	OOCYSTIS PARVA	99	977	--	56	419	170	461	362	335	420	--	--
OOC SOL	3	OOCYSTIS SOLITARIA	547	373	--	1,219	--	232	336	227	1,448	578	2,650	493
PED BIR	3	PEDIASTRUM BIRADIATUM	--	147	--	--	--	--	--	5,908	--	--	--	--
PED OBT	3	PEDIASTRUM OBTUSUM	--	--	--	--	--	--	--	710	--	--	--	--
PED TET	3	PEDIASTRUM TETRAS	--	367	--	--	--	--	438	--	--	--	--	--
PED TET TE	3	PEDIASTRUM TETRAS V TETRAODON	105	455	--	--	--	187	336	1,077	--	--	--	--
SCE ACU	3	SCENEDESMUS ACUMINATUS	--	--	--	--	49	97	4,595	--	--	--	--	--
SCE ARM	3	SCENEDESMUS ARMATUS	243	--	--	2,668	--	415	--	--	--	--	--	--

## EXHIBIT C-14

Porta-PSTA Average Algal Cell Counts (# cells/m<sup>2</sup> x 10<sup>6</sup>), April 2000 - October 2000

Organism Code	Division Code	Organism	Treatment											
			3	4	7	11	12	13	14	15	16	17	18	19
SCE BIJ	3	SCENEDESMUS BIJUGA	661	579	517	1,320	468	583	870	984	1,611	1,380	711	192
SCE BIJ AL	3	SCENEDESMUS BIJUGA V ALTERNANS	--	589	--	--	98	385	345	588	--	--	4,501	--
SCE DEN	3	SCENEDESMUS DENTICULATUS	598	--	--	2,361	--	204	--	1,180	--	--	--	--
SCE DIM	3	SCENEDESMUS DIMORPHUS	544	--	--	--	49	448	--	--	--	--	--	--
SCE QUA	3	SCENEDESMUS QUADRICAUDA	231	--	--	--	191	416	--	224	594	--	--	--
SCE SUB	3	SCENEDESMUS SUBSPICATUS	926	--	--	--	--	--	--	--	--	--	--	--
SCH SET	3	SCHROEDERIA SETIGERA	--	--	--	--	--	--	--	269	--	--	--	--
SPH SCH	3	SPHAEROCYSTIS SCHROERTERI	408	1,291	--	445	--	901	1,522	2,982	12,505	5,886	--	--
SPO PLA	3	SPONDYLOPSIUM PLANUM	--	--	--	--	--	--	--	--	--	--	--	--
STAU HEX	3	STAURASTRUM HEXACERUM	--	--	--	--	--	56	--	--	--	--	--	--
STAU MAN	3	STAURASTRUM MANFELDTII	38	--	--	--	--	--	--	269	--	--	--	--
STAU PAR P	3	STAURASTRUM PARADOXUM V PARVULUM	243	--	--	--	--	94	--	--	--	--	--	--
STAU TET	3	STAURASTRUM TETRACERUM	298	285	--	--	89	163	90	183	--	--	--	--
TET MIN	3	TETRAEDRON MINIMUM	53	114	--	56	24	25	41	482	105	--	118	524
TET TRI	3	TETRAEDRON TRIGONUM	256	74	--	351	85	76	246	316	563	283	563	--
UN CHL FI	3	UNID CHLOROPHYCEAE FILAMENT BASAL CELLS	--	--	--	--	--	--	--	460	--	--	--	--
UN FIL CH	3	UNID FILAMENTOUS CHLOROPHYTA	525	442	2,243	442	264	204	295	307	--	3,130	7,858	1,851
ACH EXI	4	ACHNANTHES EXIGUA	--	--	--	--	105	--	--	--	--	283	--	--
ACHN MIN	4	ACHNANTHIDIUM MINUTISSIMUM	276	500	633	629	85	88	283	773	875	736	2,650	61
AMP LIN	4	AMPHORA LINEOLATA?	--	747	129	--	--	69	--	--	--	--	--	--
AMP OVA AF	4	AMPHORA OVALIS V AFFINIS	--	--	--	--	--	--	--	--	--	--	--	--
AMP PEL	4	AMPHIPLEURA PELLUCIDA	--	--	--	--	--	25	--	--	--	--	--	--
AMP VEN	4	AMPHORA VENETA	--	--	129	--	--	--	--	--	--	--	--	--
BRA VIT	4	BRACHYSIRA VITREA	57	--	1,468	--	--	118	--	125	--	283	118	--
COC PLA LI	4	COCCONEIS PLACENTULA V LINEATA	--	--	--	--	--	--	--	--	--	--	--	--
COS GRA	4	COSCINODISCUS GRANII	--	--	--	--	12	--	--	--	--	--	--	--
CYC MEN	4	CYCLOTELLA MENEGHINIANA	161	--	--	147	--	74	6	--	130	--	--	--
CYM MIC	4	CYMBELLA MICROCEPHALA	180	229	--	438	12	246	146	252	349	371	1,100	1,016
DIP ELL	4	DIPLONEIS ELLIPTICA	--	--	--	--	--	98	--	--	--	--	--	--
DIP FIN	4	DIPLONEIS FINNICA	275	--	--	--	66	--	--	--	--	--	--	--
DIP OBL	4	DIPLONEIS OBLONGELLA	366	421	--	407	90	302	--	--	263	--	--	--
DIP OVA	4	DIPLONEIS OVALIS	242	102	--	--	45	79	112	112	702	--	--	--
ENC EVE	4	ENCYONEMA EVERGLADIANUM	706	2,694	2,240	5,484	77	550	1,765	1,486	2,355	1,930	2,391	550
ENC MIN	4	ENCYONEMA MINUTUM	--	--	--	--	--	--	--	576	--	--	--	--
ENC SIL	4	ENCYONEMA SILESIACUM	--	--	--	--	105	--	--	--	--	--	--	--
ENC SIL EL	4	ENCYONEMA SILESIACUM V ELEGANS	199	686	441	--	105	75	15	558	335	95	1,110	356
EPI ADN	4	EPITHEMIA ADNATA	243	--	--	--	--	--	--	590	--	--	--	--
EUN PEC MI	4	EUNOTIA PECTINALIS V MINOR	463	--	--	--	--	--	--	56	--	--	--	--
FRA FAS	4	FRAGILARIA FASCICULATA?	--	--	--	--	--	--	--	--	--	--	--	--
FRA NAN	4	FRAGILARIA NANANA?	159	491	446	667	--	31	34	32	565	337	578	96
FRA SYN	4	FRAGILARIA SYNEGROTESCA	362	533	1,014	1,180	205	151	726	570	941	283	5,300	351
FRA ULN	4	FRAGILARIA ULNA	122	--	--	--	--	25	--	311	--	--	--	--
G AMP	4	AMPHORA SP	--	--	--	--	--	--	--	--	--	--	--	--
G NAV SM	4	NAVICULA SP (SMALL)	--	--	--	--	--	--	--	--	--	--	--	--
G NIT	4	NITZSCHIA SP	--	--	--	--	--	--	--	--	--	--	--	--
G NIT ME	4	NITZSCHIA SP (MEDIUM)	37	--	--	--	--	--	--	--	133	--	--	--
G NIT SM	4	NITZSCHIA SP (SMALL)	282	473	1,267	--	65	155	559	331	739	--	--	--
G STE	4	STEPHANODISCUS SP	--	--	--	--	--	--	5	--	--	--	--	--
GOM AFF IN	4	GOMPHONEMA AFFINE V INSIGNE	71	--	--	--	--	--	--	269	--	--	--	--
GOM GRA	4	GOMPHONEMA GRACILE	--	--	--	--	24	--	--	--	--	--	--	--
GOM INT VI	4	GOMPHONEMA INTRICATUM V VIBRIO	289	--	--	--	--	65	50	6	280	571	--	--
GOM PAR	4	GOMPHONEMA PARVULUM	--	--	--	--	--	210	85	--	239	--	--	--

## EXHIBIT C-14

Porta-PSTA Average Algal Cell Counts (# cells/m<sup>2</sup> x 10<sup>6</sup>), April 2000 - October 2000

Organism Code	Division Code	Organism	Treatment											
			3	4	7	11	12	13	14	15	16	17	18	19
GYR OBS	4	GYROSIGMA OBSCURUM?	90	--	--	--	--	--	--	--	--	--	--	--
MAS LANC	4	MASTOGLOIA LANCEOLATA	--	707	--	--	66	123	655	311	--	450	1,230	617
MAS SMI	4	MASTOGLOIA SMITHII	273	1,325	1,286	868	207	211	1,106	918	1,088	615	4,115	679
MAS SMI LA	4	MASTOGLOIA SMITHII V LACUSTRIS	572	1,000	1,635	1,028	150	200	2,931	724	1,800	876	3,033	1,182
NAV CRY	4	NAVICULA CRYPTOCEPHALA	--	--	633	--	25	267	15	549	--	557	--	--
NAV CRYP	4	NAVICULA CRYPTOTENELLA	232	394	129	361	89	219	213	349	429	283	--	--
NAV POD	4	NAVICULA PODZORSKII	202	368	--	56	--	167	--	100	847	283	--	--
NAV PUP RE	4	NAVICULA PUPULA V RECTANGULARIS	--	--	--	--	--	46	--	--	--	--	--	--
NAV RAD	4	NAVICULA RADIOSA	--	--	--	--	--	--	--	--	--	--	--	--
NAV RAD PA	4	NAVICULA RADIOSA V PARVA	--	563	--	590	12	578	112	--	--	--	--	--
NAV SUBR	4	NAVICULA SUBRHYNCHOCEPHALA	--	--	--	--	--	73	--	--	--	--	--	--
NIT ACI	4	NITZSCHIA ACICULARIS	--	--	--	--	--	--	6	--	--	--	--	--
NIT AMP	4	NITZSCHIA AMPHIBIA	122	147	--	--	--	78	5	430	1,407	--	--	--
NIT ANG	4	NITZSCHIA ANGUSTATA	--	--	--	--	--	73	--	--	--	--	--	--
NIT CON	4	NITZSCHIA CONSTRICTA	--	114	--	--	--	82	6	--	--	--	--	--
NIT FRU	4	NITZSCHIA FRUSTULUM	--	--	--	--	--	--	--	--	--	--	--	--
NIT NAN	4	NITZSCHIA NANA	--	--	--	--	--	94	--	--	--	--	--	--
NIT PAL	4	NITZSCHIA PALEA	--	606	863	--	--	111	272	206	228	--	2,650	--
NIT PALE	4	NITZSCHIA PALEACEA	--	1,175	1,842	667	37	144	96	202	498	--	845	312
NIT PALF	4	NITZSCHIA PALEAFORMIS	--	--	--	--	--	--	708	--	576	--	--	580
NIT SCA	4	NITZSCHIA SCALARIS	--	--	--	--	--	--	--	--	--	--	--	--
NIT SEM	4	NITZSCHIA SEMIROBUSTA	315	437	446	473	656	1,229	411	1,077	998	677	--	727
NIT SERP	4	NITZSCHIA SERPENTIRAPHE	74	--	561	--	--	85	--	590	172	--	--	--
PIN VIR	4	PINNULARIA VIRIDIS	--	--	--	--	24	--	--	--	--	--	--	--
PIN VIR MI	4	PINNULARIA VIRIDIS V MINOR	122	--	--	--	--	37	--	--	--	--	--	--
RHO GIBA	4	RHOPALODIA GIBBA	151	--	129	--	18	104	15	191	--	--	--	131
SYN ACU	4	SYNEDRA ACUS	--	--	--	--	--	25	--	--	--	--	--	--
OPH DES MI	7	OPHIOCYTIUM DESERTUM V MINOR	73	--	--	--	--	--	--	--	--	--	--	--
G EUG	10	EUGLENA SP	--	237	--	--	--	59	5	269	--	--	--	--
G CHI	11	CHILOMONAS SP	23	--	--	--	--	--	--	--	--	--	--	--
G CHRM	11	CHROOMONAS SP	--	--	--	--	--	578	--	--	--	--	--	--
G CRY	11	CRYPTOMONAS SP	--	--	--	--	--	--	--	--	571	677	--	--
G GYM SM	12	GYMNOdinium SP (SMALL)	--	--	--	--	--	46	16	--	--	--	--	--
PER INC	12	PERIDINIUM INCONSPICUUM	--	--	129	--	--	25	45	--	--	--	--	--
PER PUS	12	PERIDINIUM PUSILLUM	--	--	--	--	--	--	--	--	--	--	118	--

## EXHIBIT C-15

Porta-PSTA Average Algal Cell Biovolume Data (cm<sup>3</sup>/m<sup>3</sup>), April 2000 - October 2000

Organism Code	Division Code	Organism	Treatment											
			3	4	7	11	12	13	14	15	16	17	18	19
G ANA	1	ANABAENA SP	0.132	0.081	--	0.014	--	0.015	0.065	0.077	0.078	0.127	--	0.035
ANAB CIR	1	ANABAENOPSIS CIRCULARIS	--	--	--	--	--	--	0.236	--	0.099	0.328	--	--
APHN FLO	1	APHANIZOMENON FLOS-AQUAE	--	--	--	--	--	0.064	0.310	--	--	--	--	1.365
APH DEL	1	APHANOCAPSA DELICATISSIMA	0.005	0.005	0.013	0.017	0.006	0.006	0.004	0.014	0.016	0.020	0.029	0.004
APH GRE	1	APHANOCAPSA GREVILLEI	--	1.393	--	--	0.018	0.019	--	--	--	--	--	--
APH INC	1	APHANOCAPSA INCERTA	--	--	--	--	--	0.003	0.006	0.025	0.017	--	--	--
APH NUB	1	APHANOCAPSA NUBLUM	--	--	--	--	--	--	0.010	0.378	--	--	--	--
APH PLA	1	APHANOCAPSA PLANCTONICA?	0.029	0.016	0.322	--	--	0.009	0.150	0.061	0.111	0.143	0.168	0.252
APHA CLA	1	APHANOTHECE CLATHRATA	0.009	0.016	0.044	0.032	--	--	0.009	0.007	0.017	0.009	0.070	0.021
APHA SMI	1	APHANOTHECE SMITHII	0.045	0.050	0.120	0.114	0.002	0.010	0.149	0.038	0.169	0.090	0.011	0.028
APHA STA	1	APHANOTHECE STAGNINA	0.126	0.324	2.846	0.231	0.047	0.091	0.160	0.264	0.808	0.495	0.325	0.762
APHA VAR	1	APHANOTHECE VARIABILIS?	--	--	--	--	--	--	0.010	--	--	--	--	--
ART TEN	1	ARTHROSPIRA TENUIS?	--	0.354	--	--	--	--	--	--	0.793	--	--	--
CAL EPI	1	CALOTHRIX EPIPHYTICA	--	--	--	--	--	--	--	0.026	--	--	--	--
CHR DIS	1	CHROOCOCCUS DISPERSUS	0.022	0.092	0.090	0.153	0.027	0.015	0.031	0.043	0.016	0.050	0.323	0.007
CHR MINI	1	CHROOCOCCUS MINIMUS	0.011	0.022	0.055	0.029	0.006	0.013	0.009	0.029	0.053	0.090	0.131	0.028
CHR MIN	1	CHROOCOCCUS MINUTUS	0.004	0.023	0.037	0.019	0.006	0.005	0.016	0.012	0.031	0.033	0.025	0.028
CHR PLA	1	CHROOCOCCUS PLANCTONICUS	--	0.106	--	--	--	--	--	--	--	--	--	--
CHR TUR	1	CHROOCOCCUS TURGIDUS	0.085	0.080	--	0.030	0.039	0.021	0.309	0.096	0.233	--	--	0.612
COE KUE	1	COELOSPHAERIUM KUETZINGIANUM	0.043	--	--	--	--	--	--	--	--	--	--	--
G CYL	1	CYLINDROSPERMUM SP	0.404	0.421	0.454	0.119	--	0.242	0.381	0.683	0.265	0.229	0.520	1.181
CYL STA	1	CYLINDROSPERMUM STAGNALE	--	--	--	--	--	--	--	--	--	--	--	--
EUC MIN	1	EUCAPSIS MINOR	--	--	--	--	--	0.003	--	--	--	--	--	--
G GLO	1	GLOEOCAPSA SP	--	0.007	0.057	0.001	0.002	0.002	0.027	0.020	0.024	0.058	0.009	0.024
GLG MEM	1	GLOEOTHECE MEMBRANACEAE	--	--	--	--	--	--	--	--	--	1.157	--	--
GOM APO	1	GOMPHOSPHAERIA APONINA	0.108	0.106	--	--	0.120	--	--	0.432	0.075	--	--	--
JOH PEL	1	JOHANNESBAPTISTIA PELLUCIDA	0.105	0.918	--	0.224	0.261	--	0.052	0.296	0.352	0.064	0.033	0.208
LYN AER	1	LYNGBYA AERUGINEO-CARULEA?	2.380	1.812	3.255	4.841	--	0.347	0.959	0.662	3.285	1.271	6.741	2.458
LYN AES	1	LYNGBYA AESTUARII	7.724	1.549	--	--	--	--	--	--	--	--	--	--
LYN CON	1	LYNGBYA CONTORTA	--	--	--	0.277	--	--	--	--	--	--	--	--
LYN EPI	1	LYNGBYA EPIPHYTICA	0.076	0.072	0.061	0.204	0.065	0.019	0.097	0.050	0.161	0.178	0.124	--
LYN LAG	1	LYNGBYA LAGERHEIMII	0.023	0.035	0.357	0.085	0.008	0.061	0.132	0.112	0.163	0.592	1.128	0.211
LYN LIM	1	LYNGBYA LIMNETICA	0.202	1.323	1.604	2.948	0.012	0.077	1.614	0.667	2.766	2.445	3.718	3.106
LYN PER	1	LYNGBYA PERELEGANS?	--	0.028	0.029	0.270	--	--	0.126	0.191	--	--	--	0.571
G LYN SM	1	LYNGBYA SP (SMALL)	--	0.086	0.103	0.054	--	0.007	0.082	0.048	0.134	0.046	0.487	0.040
LYN TAY	1	LYNGBYA TAYLORII?	--	--	--	7.189	--	--	--	--	--	--	--	--
MER DUP	1	MERISMOPEDIA DUPLEX	--	--	--	--	--	0.013	--	--	--	--	--	--
MER GLA	1	MERISMOPEDIA GLAICA	0.028	0.006	--	0.033	0.001	0.010	0.071	0.041	0.010	--	--	--
MER PUN	1	MERISMOPEDIA PUNCTATA	--	0.032	--	--	--	0.011	--	--	0.018	--	--	--
MER TEN	1	MERISMOPEDIA TENUISSIMA	0.001	0.001	0.000	0.005	0.001	0.003	0.004	0.014	0.002	0.001	--	--
MIC AER	1	MICROCYSTIS AERUGINOSA	0.330	--	--	--	0.064	0.173	--	--	0.052	--	--	--
MIC FIR	1	MICROCYSTIS FIRMA	0.135	0.052	0.655	--	0.014	--	0.145	0.200	0.137	0.780	0.038	0.073
MIC FLO	1	MICROCYSTIS FLOS-AQUAE	--	--	--	--	0.866	--	--	--	--	--	--	--
MIC SMI	1	MICROCYSTIS SMITHII	--	--	0.562	--	0.016	--	--	--	--	3.635	--	--
OSC AMP	1	OSCILLATORIA AMPHIBIA	--	1.219	--	--	--	0.090	0.616	0.083	0.907	--	--	0.552
OSC AMPH	1	OSCILLATORIA AMPHIGRANULATA	--	--	--	--	--	0.019	--	--	--	--	--	--
OSC ANG	1	OSCILLATORIA ANGUSTISSIMA	0.051	0.086	0.103	0.050	0.006	0.014	0.035	0.045	0.061	0.101	0.225	0.152
OSC FOR	1	OSCILLATORIA FORMOSA	0.449	1.121	1.585	2.792	0.068	0.182	3.708	0.677	2.791	2.574	2.545	3.149
OSC LIM	1	OSCILLATORIA LIMNETICA	0.112	0.465	1.056	0.496	0.015	0.036	0.481	0.186	0.334	0.505	1.800	0.681

## EXHIBIT C-15

Porta-PSTA Average Algal Cell Biovolume Data (cm<sup>3</sup>/m<sup>3</sup>), April 2000 - October 2000

Organism Code	Division Code	Organism	Treatment											
			3	4	7	11	12	13	14	15	16	17	18	19
OSC LIMO	1	OSCILLATORIA LIMOSA	--	--	15.127	--	--	--	--	1.533	7.736	--	--	--
G OSC ME	1	OSCILLATORIA SP (MEDIUM)	--	--	--	--	--	0.024	--	--	3.008	--	--	--
G OSC SM	1	OSCILLATORIA SP (SMALL)	0.077	0.038	--	0.027	--	0.004	0.031	0.069	0.014	0.221	0.066	0.011
OSC TEN	1	OSCILLATORIA TENUIS	--	0.784	--	--	--	--	--	--	--	--	0.332	--
OSC WIL	1	OSCILLATORIA WILLEI?	--	--	--	0.056	--	--	2.654	0.118	0.585	0.595	--	--
PHO LUC	1	PHORMIDIUM LUCIDUM?	--	--	--	--	--	--	--	0.314	--	--	--	--
PHO TEN	1	PHORMIDIUM TENUUE	--	0.055	--	0.044	--	--	--	0.161	0.663	--	--	--
RHA LIN	1	RHABDODERMA LINEARE?	0.955	0.181	--	0.503	--	--	0.349	1.127	0.179	0.183	0.086	0.065
SCH ARE	1	SCHIZOTHRIX ARENARIA?	0.136	0.658	--	0.954	--	--	0.311	0.254	0.496	0.255	0.685	--
SCY HOF	1	SCYTONEEMA HOFMANII?	--	--	--	--	--	--	--	--	2.139	--	--	--
G SCY	1	SCYTONEEMA SP?	15.599	--	20.189	2.451	--	0.947	8.179	3.826	17.428	--	121.129	30.543
SNO LAC	1	SNOWELLA LACUSTRIS	--	0.055	--	--	--	0.045	0.070	0.135	0.080	--	--	--
SPI LAX	1	SPIRULINA LAXA	--	--	--	--	--	--	--	--	--	0.060	--	--
SPI MAJ	1	SPIRULINA MAJOR	--	--	--	--	--	--	0.030	--	--	--	--	--
SPI SUB	1	SPIRULINA SUBSALSA	0.059	0.054	0.058	0.038	--	0.013	0.069	0.075	0.043	0.057	0.185	0.065
G SYNE	1	SYNECHOCOCCUS SP	3.347	1.713	0.155	1.937	0.003	0.891	2.826	2.511	1.213	2.334	0.452	0.558
ANK FAL	3	ANKISTRODESMUS FALCATUS	0.015	--	--	0.035	0.004	0.017	0.014	0.006	0.026	--	--	0.007
ANK NAN	3	ANKISTRODESMUS NANNOSELENE	0.001	0.000	0.002	0.003	0.001	0.001	0.001	0.001	0.000	--	--	0.000
ANK SPI	3	ANKISTRODESMUS SPIRALIS	0.002	0.006	0.035	0.004	0.001	0.003	0.007	0.006	0.008	--	0.019	0.001
CHA ENS	3	CHARACIUM ENSIFORME	--	--	--	--	--	--	0.000	--	--	--	--	--
G CHLA	3	CHLAMYDOMONAS SP	0.014	0.071	--	--	--	0.007	0.024	--	--	--	--	--
CLO PAR	3	CLOSTERIUM PARVULUM	--	0.167	--	--	--	0.078	0.007	0.026	--	--	--	--
COE MIC	3	COELASTRUM MICROPORUM	--	--	--	--	--	0.013	0.299	--	0.300	--	--	--
COE SPH	3	COELASTRUM SPAERICUM	0.113	0.092	--	0.416	--	0.052	0.053	0.183	--	--	--	0.038
COS BOT	3	COSMARIUM BOTRYTIS	--	--	--	--	--	--	--	--	10.919	--	--	--
COS GRAN	3	COSMARIUM GRANATUM	--	--	--	--	--	--	--	--	1.385	--	--	--
COS PUN	3	COSMARIUM PUNCTULATUM	--	--	--	--	--	--	0.150	--	5.978	--	--	--
G COS	3	COSMARIUM SP	--	--	--	--	--	0.147	--	--	--	--	--	--
COS SUBR	3	COSMARIUM SUBRENIFORME	0.017	0.030	--	0.155	0.010	0.023	0.090	0.129	0.126	0.025	--	0.034
COS TUB	3	COSMOCLADIUM TUBerculatum	--	--	--	--	--	--	--	--	--	--	--	--
CRU API	3	CRUCIGENIA APICULATA	--	0.025	--	--	--	0.005	0.023	--	--	--	--	--
DIC PUL	3	DICTYOSPHAERIUM PULCELLUM	--	--	--	--	--	--	--	--	--	0.062	--	--
ELA GEL	3	ELAKATOTHRICE GELATINOSA	0.018	--	--	--	--	--	--	--	--	--	--	--
EUA COR ME	3	EUASTRUM CORNUBIENSE V MEDIANUM	0.062	1.249	0.341	0.294	--	0.092	0.233	0.635	0.272	0.889	7.622	1.300
EUA VER	3	EUASTRUM VERRUCOSUM	--	--	--	--	--	4.136	--	--	--	--	--	--
GOL RAD	3	GOLENKINIA RADIATA	0.028	--	--	--	--	--	--	--	--	--	--	--
G GONA	3	GONATOZYGON SP	--	0.516	--	--	--	--	--	--	--	--	--	--
KIR CON	3	KIRCHNERIELLA CONTORTA	--	--	--	--	--	--	0.026	--	--	--	--	--
KIR LUN	3	KIRCHNERIELLA LUNARIS	0.003	0.001	--	--	--	0.001	0.000	0.003	--	--	--	--
KIR OBE	3	KIRCHNERIELLA OBESA	0.002	--	--	0.011	--	0.000	0.000	--	0.003	--	--	--
LAG SUB	3	LAGERHEIMIA SUBSALSA	--	--	--	--	--	0.005	--	--	--	--	--	--
MIC PIN	3	MICRASTERIAS PINNATIFIDA	2.700	--	--	--	--	--	--	--	--	--	--	--
G MOU	3	MOUGEOTIA SP	--	--	--	--	--	0.106	--	--	--	--	--	--
OED PUN	3	OEDOGONIUM PUNCTATOSTRIATUM	0.944	--	--	--	--	13.634	7.133	7.183	--	26.014	80.005	17.800
G OED	3	OEDOGONIUM SP	1.466	2.581	2.597	--	--	0.330	4.801	2.124	--	--	--	--
OOC PAR	3	OOCYSTIS PARVA	0.002	0.024	--	0.001	0.010	0.004	0.011	0.009	0.008	0.011	--	--
OOC SOL	3	OOCYSTIS SOLITARIA	0.742	0.507	--	1.654	--	0.315	0.456	0.309	1.965	0.785	3.597	0.668
PED BIR	3	PEDIASTRUM BIRADIATUM	--	0.020	--	--	--	--	--	0.798	--	--	--	--
PED OBT	3	PEDIASTRUM OBTUSUM	--	--	--	--	--	--	--	0.034	--	--	--	--

## EXHIBIT C-15

Porta-PSTA Average Algal Cell Biovolume Data (cm<sup>3</sup>/m<sup>3</sup>), April 2000 - October 2000

Organism Code	Division Code	Organism	Treatment											
			3	4	7	11	12	13	14	15	16	17	18	19
PED TET	3	PEDIASTRUM TETRAS	--	0.027	--	--	--	--	0.032	--	--	--	--	--
PED TET TE	3	PEDIASTRUM TETRAS V TETRAODON	0.009	0.038	--	--	--	0.016	0.028	0.090	--	--	--	--
SCE ACU	3	SCENEDESMUS ACUMINATUS	--	--	--	--	0.001	0.003	0.124	--	--	--	--	--
SCE ARM	3	SCENEDESMUS ARMATUS	0.016	--	--	0.179	--	0.028	--	--	--	--	--	--
SCE BIJ	3	SCENEDESMUS BIJUGA	0.007	0.006	0.005	0.013	0.005	0.006	0.009	0.010	0.016	0.014	0.007	0.002
SCE BIJ AL	3	SCENEDESMUS BIJUGA V ALTERNANS	--	0.019	--	--	0.003	0.012	0.011	0.019	--	--	0.144	--
SCE DEN	3	SCENEDESMUS DENTICULATUS	0.124	--	--	0.489	--	0.042	--	0.244	--	--	--	--
SCE DIM	3	SCENEDESMUS DIMORPHUS	0.013	--	--	--	0.001	0.011	--	--	--	--	--	--
SCE QUA	3	SCENEDESMUS QUADRICAUDA	0.024	--	--	--	0.019	0.042	--	0.023	0.061	--	--	--
SCE SUB	3	SCENEDESMUS SUBSPICATUS	0.035	--	--	--	--	--	--	--	--	--	--	--
SCH SET	3	SCHROEDERIA SETIGERA	--	--	--	--	--	--	0.046	--	--	--	--	--
SPH SCH	3	SPHAEROCYSTIS SCHROERTERI	0.046	0.146	--	0.050	--	0.102	0.172	0.337	1.413	0.665	--	--
G SPI	3	SPIROGYRA SP	--	--	--	--	--	--	--	82.762	91.058	--	--	--
SPO PLA	3	SPONDYLOPSIUM PLANUM	--	--	--	--	--	--	--	--	--	--	--	--
STAU HEX	3	STAURASTRUM HEXACERUM	--	--	--	--	--	0.294	--	--	--	--	--	--
STAU MAN	3	STAURASTRUM MANFELDTII	0.241	--	--	--	--	--	--	1.697	--	--	--	--
STAU PAR P	3	STAURASTRUM PARADOXUM V PARVULUM	0.042	--	--	--	--	0.016	--	--	--	--	--	--
G STAU	3	STAURASTRUM SP	--	--	--	--	0.016	--	--	--	--	--	--	--
STAU TET	3	STAURASTRUM TETRACERUM	0.017	0.016	--	--	0.005	0.009	0.005	0.010	--	--	--	--
TET MIN	3	TETRAEDRON MINIMUM	0.002	0.005	--	0.003	0.001	0.001	0.002	0.022	0.005	--	0.005	0.024
TET TRI	3	TETRAEDRON TRIGONUM	0.249	0.072	--	0.341	0.083	0.074	0.239	0.307	0.547	0.276	0.547	--
UN CHL FI	3	UNID CHLOROPHYCEAE FILAMENT BASAL CELLS	--	--	--	--	--	--	--	0.036	--	--	--	--
UN FIL CH	3	UNID FILAMENTOUS CHLOROPHYTA	0.445	0.374	1.902	0.374	0.224	0.173	0.250	0.260	--	2.655	6.664	1.570
ACH EXI	4	ACHNANTHES EXIGUA	--	--	--	--	0.014	--	--	--	--	0.037	--	--
ACHN MIN	4	ACHNANTIDIUM MINUTISSIMUM	0.039	0.070	0.089	0.088	0.012	0.012	0.040	0.108	0.123	0.103	0.371	0.009
AMP PEL	4	AMPHIPLEURA PELLUCIDA	--	--	--	--	--	0.060	--	--	--	--	--	--
AMP LIN	4	AMPHORA LINEOLATA?	--	4.061	0.702	--	--	0.378	--	--	--	--	--	--
AMP OVA AF	4	AMPHORA OVALIS V AFFINIS	--	--	--	--	--	--	--	--	--	--	--	--
G AMP	4	AMPHORA SP	--	--	--	--	--	--	--	--	--	--	--	--
AMP VEN	4	AMPHORA VENETA	--	--	0.052	--	--	--	--	--	--	--	--	--
BRA VIT	4	BRACHYSIRA VITREA	0.026	--	0.672	--	--	0.054	--	0.057	--	0.130	0.054	--
COC PLA LI	4	COCCONEIS PLACENTULA V LINEATA	--	--	--	--	--	--	--	--	--	--	--	--
COS GRA	4	COSCINODISCUS GRANII	--	--	--	--	4.065	--	--	--	--	--	--	--
CYC MEN	4	CYCLOTELLA MENEGHINIANA	0.174	--	--	0.159	--	0.080	0.006	--	0.140	--	--	--
CYM MIC	4	CYMBELLA MICROCEPHALA	0.031	0.039	--	0.074	0.002	0.042	0.025	0.043	0.059	0.063	0.187	0.173
DIP ELL	4	DIPLONEIS ELLIPTICA	--	--	--	--	--	0.123	--	--	--	--	--	--
DIP FIN	4	DIPLONEIS FINNICA	14.580	--	--	--	3.504	--	--	--	--	--	--	--
DIP OBL	4	DIPLONEIS OBLONGELLA	0.123	0.142	--	0.137	0.030	0.102	--	--	0.088	--	--	--
DIP OVA	4	DIPLONEIS OVALIS	0.098	0.041	--	--	0.018	0.032	0.045	0.045	0.283	--	--	--
ENC EVE	4	ENCYONEMA EVERGLADIANUM	0.133	0.506	0.421	1.031	0.014	0.103	0.332	0.279	0.443	0.363	0.449	0.103
ENC MIN	4	ENCYONEMA MINUTUM	--	--	--	--	--	--	--	--	0.101	--	--	--
ENC SIL	4	ENCYONEMA SILESIACUM	--	--	--	--	0.078	--	--	--	--	--	--	--
ENC SIL EL	4	ENCYONEMA SILESIACUM V ELEGANS	0.240	0.827	0.532	--	0.126	0.090	0.018	0.672	0.404	0.115	1.339	0.429
EPI ADN	4	EPITHEMIA ADNATA	2.041	--	--	--	--	--	--	4.960	--	--	--	--
EUN PEC MI	4	EUNOTIA PECTINALIS V MINOR	0.422	--	--	--	--	--	--	0.051	--	--	--	--
FRA FAS	4	FRAGILARIA FASCICULATA?	--	--	--	--	--	--	--	--	--	--	--	--
FRA NAN	4	FRAGILARIA NANANA?	0.060	0.185	0.168	0.251	--	0.012	0.013	0.012	0.213	0.127	0.218	0.036
FRA SYN	4	FRAGILARIA SYNEGROTESCA	0.388	0.571	1.087	1.265	0.220	0.162	0.778	0.612	1.009	0.304	5.682	0.376
FRA ULN	4	FRAGILARIA ULNA	1.437	--	--	--	--	0.298	--	3.657	--	--	--	--

## EXHIBIT C-15

Porta-PSTA Average Algal Cell Biovolume Data (cm<sup>3</sup>/m<sup>3</sup>), April 2000 - October 2000

Organism Code	Division Code	Organism	Treatment											
			3	4	7	11	12	13	14	15	16	17	18	19
GOM AFF IN	4	GOMPHONEMA AFFINE V INSIGNE	0.096	--	--	--	--	--	--	0.365	--	--	--	--
GOM GRA	4	GOMPHONEMA GRACILE	--	--	--	--	0.009	--	--	--	--	--	--	--
GOM INT VI	4	GOMPHONEMA INTRICATUM V VIBRIO	0.631	--	--	--	0.141	0.109	0.012	0.612	1.246	--	--	--
GOM PAR	4	GOMPHONEMA PARVULUM	--	--	--	--	0.374	0.152	--	0.427	--	--	--	--
GYR OBS	4	GYROSIGMA OBSCURUM?	0.778	--	--	--	--	--	--	--	--	--	--	--
MAS LANC	4	MASTOGLOIA LANCEOLATA	--	4.745	--	--	0.444	0.824	4.397	2.088	--	3.023	8.257	4.146
MAS SMI	4	MASTOGLOIA SMITHII	0.950	4.610	4.472	3.019	0.719	0.732	3.847	3.194	3.785	2.140	14.313	2.360
MAS SMI LA	4	MASTOGLOIA SMITHII V LACUSTRIS	0.919	1.608	2.629	1.653	0.241	0.322	4.712	1.165	2.894	1.408	4.878	1.901
NAV CRY	4	NAVICULA CRYPTOCEPHALA	--	--	0.269	--	0.010	0.113	0.006	0.233	--	0.236	--	--
NAV CRYP	4	NAVICULA CRYPTOTENELLA	0.172	0.292	0.096	0.268	0.066	0.163	0.158	0.259	0.319	0.210	--	--
NAV POD	4	NAVICULA PODZORSKII	0.446	0.811	--	0.123	--	0.369	--	0.220	1.868	0.625	--	--
NAV PUP RE	4	NAVICULA PUPULA V RECTANGULARIS	--	--	--	--	--	0.041	--	--	--	--	--	--
NAV RAD	4	NAVICULA RADIOSA	--	--	--	--	--	--	--	--	--	--	--	--
NAV RAD PA	4	NAVICULA RADIOSA V PARVA	--	0.532	--	0.558	0.012	0.546	0.106	--	--	--	--	--
G NAV SM	4	NAVICULA SP (SMALL)	--	--	--	--	--	--	--	--	--	--	--	--
NAV SUBR	4	NAVICULA SUBRHYNCHOCEPHALA	--	--	--	--	--	0.059	--	--	--	--	--	--
NIT ACI	4	NITZSCHIA ACICULARIS	--	--	--	--	--	--	0.001	--	--	--	--	--
NIT AMP	4	NITZSCHIA AMPHIBIA	0.029	0.035	--	--	--	0.019	0.001	0.103	0.338	--	--	--
NIT ANG	4	NITZSCHIA ANGUSTATA	--	--	--	--	--	0.124	--	--	--	--	--	--
NIT CON	4	NITZSCHIA CONSTRICTA	--	0.069	--	--	--	0.050	0.004	--	--	--	--	--
NIT FRU	4	NITZSCHIA FRUSTULUM	--	--	--	--	--	--	--	--	--	--	--	--
NIT NAN	4	NITZSCHIA NANA	--	--	--	--	--	0.265	--	--	--	--	--	--
NIT PAL	4	NITZSCHIA PALEA	--	0.318	0.453	--	--	0.058	0.143	0.108	0.120	--	1.391	--
NIT PALE	4	NITZSCHIA PALEACEA	--	0.074	0.116	0.042	0.002	0.009	0.006	0.013	0.031	--	0.053	0.020
NIT PALF	4	NITZSCHIA PALEAFORMIS	--	--	--	--	--	--	0.604	--	0.492	--	--	0.496
NIT SCA	4	NITZSCHIA SCALARIS	--	--	--	--	--	--	--	--	--	--	--	--
NIT SEM	4	NITZSCHIA SEMIROBUSTA	0.185	0.257	0.262	0.278	0.385	0.722	0.241	0.633	0.587	0.398	--	0.427
NIT SERP	4	NITZSCHIA SERPENTIRAPHE	0.690	--	5.212	--	--	0.788	--	5.487	1.597	--	--	--
G NIT	4	NITZSCHIA SP	--	--	--	--	--	--	--	--	--	--	--	--
G NIT ME	4	NITZSCHIA SP (MEDIUM)	0.057	--	--	--	--	--	--	--	0.207	--	--	--
G NIT SM	4	NITZSCHIA SP (SMALL)	0.030	0.050	0.134	--	0.007	0.016	0.059	0.035	0.078	--	--	--
PIN VIR	4	PINNULARIA VIRIDIS	--	--	--	--	2.034	--	--	--	--	--	--	--
PIN VIR MI	4	PINNULARIA VIRIDIS V MINOR	3.480	--	--	--	--	1.052	--	--	--	--	--	--
RHO GIBA	4	RHOPALODIA GIBBA	3.821	--	3.272	--	0.464	2.646	0.375	4.832	--	--	--	3.316
G STE	4	STEPHANODISCUS SP	--	--	--	--	--	--	0.006	--	--	--	--	--
SYN ACU	4	SYNEDRA ACUS	--	--	--	--	--	0.055	--	--	--	--	--	--
OPH DES MI	7	OPHIOCYTIUM DESERTUM V MINOR	0.071	--	--	--	--	--	--	--	--	--	--	--
G EUG	10	EUGLENA SP	--	3.048	--	--	--	0.759	0.062	3.462	--	--	--	--
G CHI	11	CHILOMONAS SP	0.066	--	--	--	--	--	--	--	--	--	--	--
G CHRM	11	CHROOMONAS SP	--	--	--	--	--	0.007	--	--	--	--	--	--
G CRY	11	CRYPTOMONAS SP	--	--	--	--	--	--	--	--	0.029	0.034	--	--
G GYM SM	12	GYMNODINIUM SP (SMALL)	--	--	--	--	--	0.027	0.009	--	--	--	--	--
PER INC	12	PERIDINIUM INCONSPICUUM	--	--	0.171	--	--	0.034	0.060	--	--	--	--	--
PER PUS	12	PERIDINIUM PUSILLUM	--	--	--	--	--	--	--	--	--	--	0.189	--

**Exhibit C-16**

Monthly Summaries of Ecosystem Metabolism Data from the Porta-PSTA Treatments, April 2000 - October 2000

Treatment	Date	NPP(day) g/m <sup>2</sup> /d	GPP(day) g/m <sup>2</sup> /d	CR(24hr) g/m <sup>2</sup> /d	CM(24hr) g/m <sup>2</sup> /d	NPP(24hr) g/m <sup>2</sup> /d	Avg Night Respiration g/m <sup>2</sup> /hr	PAR(24hr) E/m <sup>2</sup> /d	Efficiency %
<b>Monthly</b>									
3	Apr-00	0.510	2.265	2.903	2.265	-0.638	0.121	37.2	1.164
	May-00	0.812	3.337	3.997	3.337	-0.660	0.167	49.7	1.284
	Jun-00	0.322	2.929	3.911	2.929	-0.982	0.163	38.4	1.459
	Jul-00	-0.253	2.068	3.504	2.068	-1.436	0.146	35.6	1.112
	Aug-00	-0.135	1.699	3.102	1.699	-1.403	0.129	28.4	1.145
4	Apr-00	2.085	4.515	4.039	4.515	0.477	0.168	39.8	2.170
	May-00	1.646	4.468	4.482	4.468	-0.014	0.187	47.4	1.802
	Jun-00	1.207	3.982	4.183	3.982	-0.201	0.174	39.2	1.946
	Jul-00	1.322	4.190	4.369	4.190	-0.179	0.182	32.8	2.445
	Aug-00	1.620	4.159	4.342	4.159	-0.183	0.181	30.2	2.634
7	Apr-00	2.746	5.346	4.160	5.346	1.186	0.173	48.3	2.117
	May-00	2.227	5.180	4.726	5.180	0.455	0.197	44.4	2.231
	Jun-00	1.644	4.759	4.673	4.759	0.086	0.195	38.0	2.396
	Jul-00	1.080	4.110	4.544	4.110	-0.434	0.189	31.9	2.462
	Aug-00	1.565	4.394	4.526	4.394	-0.132	0.189	34.6	2.430
11	Apr-00	2.167	4.725	4.292	4.725	0.433	0.179	43.8	2.065
	May-00	1.426	4.006	4.039	4.006	-0.034	0.168	40.0	1.917
	Jun-00	0.886	3.392	3.759	3.392	-0.367	0.157	22.1	2.934
	Jul-00	1.108	3.354	3.491	3.354	-0.137	0.145	21.1	3.045
	Aug-00	1.818	4.082	3.881	4.082	0.201	0.162	30.8	2.539
12	Apr-00	0.244	1.970	2.958	1.970	-0.988	0.123	31.7	1.187
	May-00	0.523	2.833	3.697	2.833	-0.863	0.154	44.9	1.208
	Jun-00	0.124	2.806	4.080	2.806	-1.274	0.170	41.9	1.280
	Jul-00	-0.011	2.264	3.496	2.264	-1.232	0.146	25.5	1.695
	Aug-00	0.904	3.226	4.072	3.226	-0.846	0.170	33.0	1.868
13	Apr-00								
	May-00	-0.074	1.166	1.963	1.166	-0.797	0.082	44.3	0.503
	Jun-00	0.606	1.907	1.952	1.907	-0.045	0.081	36.4	1.002
	Jul-00	0.701	2.273	2.401	2.273	-0.128	0.100	29.5	1.476
	Aug-00	1.572	3.736	3.647	3.736	0.089	0.152	27.8	2.575
14	Apr-00	0.316	1.416	1.761	1.416	-0.345	0.073	44.4	0.611
	May-00	1.559	3.719	3.321	3.719	0.398	0.138	43.2	1.647
	Jun-00	1.633	3.820	3.374	3.820	0.446	0.141	29.9	2.440
	Jul-00	1.064	3.577	3.822	3.577	-0.245	0.159	27.8	2.458
	Aug-00	1.741	4.235	4.275	4.235	-0.040	0.178	30.6	2.648
15	Apr-00	0.353	2.119	2.940	2.119	-0.820	0.122	38.9	1.043
	May-00	0.243	1.279	1.643	1.279	-0.364	0.068	45.8	0.534
	Jun-00	0.358	1.646	1.932	1.646	-0.286	0.081	34.0	0.928
	Jul-00	0.085	1.484	2.118	1.484	-0.634	0.088	25.0	1.136
	Aug-00	0.497	1.834	2.194	1.834	-0.360	0.091	30.2	1.161
16	Apr-00	-0.008	0.385	0.674	0.385	-0.289	0.028	31.7	0.232
	May-00	0.568	1.380	1.300	1.380	0.080	0.054	43.4	0.609
	Jun-00	0.837	2.512	2.529	2.512	-0.017	0.105	36.4	1.320
	Jul-00	0.782	2.297	2.346	2.297	-0.049	0.098	29.1	1.509
	Aug-00	1.273	3.085	3.131	3.085	-0.045	0.130	34.8	1.695
17	Apr-00	0.663	1.322	1.054	1.322	0.268	0.044	45.6	0.555
	May-00	1.923	3.463	2.409	3.463	1.054	0.100	51.6	1.283
	Jun-00	2.325	3.974	2.475	3.974	1.500	0.103	39.3	1.936
	Jul-00	2.129	4.169	3.060	4.169	1.109	0.127	40.2	1.984
	Aug-00	1.586	3.017	2.453	3.017	0.564	0.102	31.9	1.812
18	Apr-00	0.678	1.723	1.709	1.723	0.014	0.071	41.3	0.799
	May-00	1.121	1.884	1.219	1.884	0.664	0.051	43.4	0.830
	Jun-00	1.045	2.201	1.734	2.201	0.467	0.072	30.9	1.364
	Jul-00	0.861	1.800	1.453	1.800	0.346	0.061	33.6	1.026
	Aug-00	1.364	2.739	2.356	2.739	0.382	0.098	36.2	1.449
19	Apr-00	1.041	2.032	1.613	2.032	0.419	0.067	44.2	0.880
	May-00	1.097	2.004	1.385	2.004	0.618	0.058	44.4	0.863
	Jun-00	1.106	1.907	1.255	1.907	0.652	0.052	27.3	1.338
	Jul-00	0.883	1.827	1.443	1.827	0.384	0.060	26.5	1.321
	Aug-00	0.941	1.599	1.128	1.599	0.471	0.047	30.6	1.000

Final Porta-PSTA sampling postponed until October due to electrical failure at ENR site.

**Exhibit C-17**

Monthly Summaries of PAR Extinction Measurements from the Porta-PSTA Treatments, April 2000 - October 2000

Treatment	Date	Water Depth (m)	PAR ( $\mu\text{mol/m}^2/\text{s}$ )		Z (m)	Ext Coeff ( $\text{m}^{-1}$ )
			Surface	Bottom		
Monthly 3	Apr-00	0.30	684.0	393.0	0.18	4.34
	May-00	0.29	685.7	244.8	0.17	5.83
	Jun-00	0.29	342.4	223.4	0.17	3.65
	Jul-00	0.29	784.2	470.1	0.16	3.29
	Aug-00	0.29	500.6	263.3	0.17	4.19
	Sep-00	0.28	121.1	76.5	0.16	2.53
4	Apr-00	0.35	1810.1	1225.9	0.23	1.67
	May-00	0.35	417.3	261.1	0.23	1.99
	Jun-00	0.36	1582.3	533.3	0.24	5.55
	Jul-00	0.35	965.6	250.0	0.23	5.54
	Aug-00	0.35	640.6	388.7	0.23	2.77
	Sep-00	0.35	229.7	120.3	0.23	3.21
7	Apr-00	0.37	1836.5	1020.7	0.25	2.38
	May-00	0.37	1222.9	290.8	0.24	5.89
	Jun-00	0.40	405.5	107.9	0.28	4.72
	Jul-00	0.36	1638.0	546.2	0.24	4.56
	Aug-00	0.37	417.2	122.3	0.24	5.03
	Sep-00	0.38	386.6	215.1	0.26	2.26
11	Apr-00	0.35	558.2	387.2	0.23	1.62
	May-00	0.35	1653.7	1150.0	0.23	1.61
	Jun-00	0.34	1478.5	1013.5	0.22	1.74
	Jul-00	0.33	1759.9	1132.6	0.21	2.10
	Aug-00	0.34	1827.3	970.0	0.21	2.97
	Sep-00	0.34	661.6	440.7	0.22	1.88
12	Apr-00	0.33	458.3	297.4	0.20	2.12
	May-00	0.35	1260.9	820.0	0.23	1.86
	Jun-00	0.36	756.0	417.5	0.24	2.47
	Jul-00	0.36	1425.4	862.7	0.24	2.11
	Aug-00	0.33	735.4	238.7	0.21	5.35
	Sep-00	0.30	229.7	111.8	0.18	3.94
13	Apr-00	0.34	1693.8	896.7	0.22	10.41
	May-00	0.35	729.7	301.5	0.22	3.14
	Jun-00	0.35	843.8	545.0	0.23	2.33
	Jul-00	0.34	1336.7	400.7	0.22	5.86
	Aug-00	0.35	1181.5	534.7	0.23	4.09
	Sep-00	0.34	293.1	110.3	0.21	4.63
14	Apr-00	0.32	2000.9	1692.8	0.19	0.86
	May-00	0.32	499.3	400.3	0.22	1.02
	Jun-00	0.32	416.3	337.3	0.19	1.04
	Jul-00	0.32	900.0	343.6	0.20	4.91
	Aug-00	0.33	283.1	175.2	0.19	2.35
	Sep-00	0.32	302.0	231.4	0.20	1.33
15	Apr-00	0.33	1786.5	1048.1	0.20	3.47
	May-00	0.33	407.3	273.0	0.21	1.95
	Jun-00	0.33	1216.2	505.5	0.20	4.84
	Jul-00	0.33	764.3	233.1	0.21	5.18
	Aug-00	0.32	742.0	408.0	0.20	3.45
	Sep-00	0.31	119.6	67.3	0.19	3.60
16	Apr-00	--	--	--	--	--
	May-00	0.11	--	--	--	--
	Jun-00	0.37	1501.1	983.5	0.24	1.75
	Jul-00	0.36	838.9	330.4	0.24	3.31
	Aug-00	0.34	570.2	262.9	0.22	3.18
	Sep-00	0.33	258.9	138.6	0.21	3.16
17	Apr-00	0.33	2069.0	1539.6	0.21	1.43
	May-00	0.32	1280.6	372.0	0.20	6.15
	Jun-00	0.33	388.3	125.0	0.21	5.39
	Jul-00	0.34	1648.5	1007.1	0.22	2.25
	Aug-00	0.34	644.6	206.6	0.22	5.11
	Sep-00	0.34	467.9	306.0	0.21	1.99
18	Apr-00	0.32	1943.4	1537.7	0.20	1.18
	May-00	0.33	574.4	410.4	0.20	1.65
	Jun-00	0.33	346.2	98.4	0.21	6.07
	Jul-00	0.36	464.2	297.3	0.23	1.90
	Aug-00	0.32	322.7	116.4	0.20	5.15
	Sep-00	0.31	360.0	143.3	0.19	4.80
19	Apr-00	0.33	1788.0	414.8	0.21	7.05
	May-00	0.33	581.7	396.4	0.20	1.88
	Jun-00	--	--	--	--	--
	Jul-00	0.34	1125.3	337.6	0.22	5.49
	Aug-00	0.33	1742.5	1003.9	0.20	2.70
	Sep-00	0.34	302.3	121.9	0.21	4.26

Note:

Extinction coefficient =  $(\ln \text{PAR}_{\text{surf}} - \ln \text{PAR}_{\text{bot}})/z$  and  $z$  = water depth - 0.122 m

**Exhibit C-18**

Porta-PSTA Sediment Trap Data, April 2000 - September 2000

Site	Tank	Soil	Treatment	Date Installed	Date Collected	PSTA #	Sediment Volume (ml)	# Days	Wet Accretion (ml/m <sup>2</sup> /y)	Dry Accretion (g/m <sup>2</sup> /y)	TP Accretion (g/m <sup>2</sup> /y)	Wet Bulk Density (g/cm <sup>3</sup> )	Dry Bulk Density (g/cm <sup>3</sup> )	Wet Weight (g)	Dry Weight (g)	Moisture Content (%)	TP (mg/kg)	Ash (%)
PORTA	1	shell	16	7/31/00	10/10/00	220	70	71	23367	1245	0.606	0.975	0.053	68.25	3.73	94.5	486.5	73.1
PORTA	2	shell	15	2/21/00	4/20/00	6660	35	59	14060	675	0.418	1.737	0.048	60.80	1.68	97.2	619.0	63.2
PORTA	2	shell	15	7/31/00	10/10/00	221	370	71	123514	2648	1.271	0.539	0.021	199.27	7.93	96.0	480.0	70.6
PORTA	3	shell	4	2/21/00	4/20/00	6661	40	59	16069	1695	0.817	1.725	0.106	68.98	4.22	93.9	481.8	81.3
PORTA	3	shell	4	7/31/00	10/10/00	222	400	71	133528	6942	2.164	0.547	0.052	218.87	20.80	90.5	311.7	74.8
PORTA	4	limerock	14	7/31/00	10/10/00	223	92	71	30712	561	0.130	0.334	0.018	30.70	1.68	94.5	230.9	63.1
PORTA	5	shell	4	2/21/00	4/20/00	6662	48	59	19282	3965	2.953	1.230	0.206	59.05	9.87	83.3	744.8	90.2
PORTA	5	shell	4	7/31/00	10/10/00	224	160	71	53411	2090	0.803	0.562	0.039	89.99	6.26	93.0	384.0	68.8
PORTA	6	shell	16	7/31/00	10/10/00	225	84	71	28041	1851	1.094	0.840	0.066	70.52	5.54	92.1	591.1	78.5
PORTA	7	limerock	14	7/31/00	10/10/00	226	13	71	4340	100	0.031	1.485	0.023	19.30	0.30	98.4	305.3	63.5
PORTA	8	limerock	14	7/31/00	10/10/00	227	13	71	4340	125	0.045	1.662	0.029	21.60	0.37	98.3	363.6	66.9
PORTA	9	peat_limed	13	7/31/00	10/10/00	228	210	71	70102	1331	0.520	0.519	0.019	109.07	3.99	96.3	390.4	62.5
PORTA	10	shell	4	2/21/00	4/20/00	6663	30	59	12052	289	0.128	1.426	0.024	42.78	0.72	98.3	442.4	61.2
PORTA	10	shell	4	7/31/00	10/10/00	229	118	71	39391	1353	0.446	0.563	0.034	66.38	4.05	93.9	330.0	69.6
PORTA	11	peat_limed	13	7/31/00	10/10/00	230	630	71	210307	642	0.285	0.286	0.003	180.17	1.92	98.9	443.6	54.1
PORTA	12	peat	3	2/21/00	4/20/00	6664	55	59	22094	554	0.311	1.927	0.025	106.00	1.38	98.7	561.1	26.9
PORTA	12	peat	3	7/31/00	10/10/00	231	100	71	33382	792	0.472	1.334	0.024	133.42	2.37	98.2	595.7	21.7
PORTA	13	shell	15	2/21/00	4/20/00	6665	25	59	10043	759	0.583	1.983	0.076	49.57	1.89	96.2	767.6	64.8
PORTA	13	shell	15	7/31/00	10/10/00	232	280	71	93470	2983	1.683	0.591	0.032	165.37	8.94	94.6	564.3	70.0
PORTA	14	peat	3	2/21/00	4/20/00	6666	14	59	5624	133	0.091	2.284	0.024	31.98	0.33	99.0	684.3	28.2
PORTA	14	peat	3	7/31/00	10/10/00	233	50	71	16691	282	0.251	1.326	0.017	66.31	0.84	98.7	892.4	44.7
PORTA	15	shell	16	7/31/00	10/10/00	234	480	71	160234	2089	0.822	0.326	0.013	156.25	6.26	96.0	393.5	65.9
PORTA	16	shell	15	2/21/00	4/20/00	6667	175	59	70300	1227	0.811	1.095	0.017	191.57	3.05	98.4	660.7	54.5
PORTA	16	shell	15	7/31/00	10/10/00	235	128	71	42729	1515	1.117	0.774	0.035	99.13	4.54	95.4	737.2	63.6
PORTA	17	peat	3	2/21/00	4/20/00	6668	17	59	6829	96	0.025	1.980	0.014	33.66	0.24	99.3	255.8	NS
PORTA	17	peat	3	7/31/00	10/10/00	236	135	71	45066	2936	1.206	1.313	0.065	177.27	8.80	95.0	410.9	35.0
PORTA	18	peat_limed	13	7/31/00	10/10/00	237	190	71	63426	2483	0.862	0.617	0.039	117.30	7.44	93.7	347.4	66.7
PORTA	19	sand	7	2/21/00	4/20/00	6669	47	59	18881	811	0.001	2.201	0.043	103.46	2.02	98.0	1.6	76.3
PORTA	19	sand	7	7/31/00	10/10/00	238	360	71	120176	2946	0.526	0.457	0.025	164.57	8.83	94.6	178.5	70.6
PORTA	20	sand_HCl	17	7/31/00	10/10/00	239	235	71	78448	2684	0.427	0.451	0.034	106.08	8.04	92.4	159.0	77.3
PORTA	21	none	18	7/31/00	10/10/00	240	370	71	123514	1529	0.378	0.339	0.012	125.58	4.58	96.4	247.3	63.7
PORTA	22	none	19	7/31/00	10/10/00	241	280	71	93470	2467	0.465	0.567	0.026	158.70	7.39	95.3	188.4	66.5
PORTA	23E	shell	11	2/21/00	4/20/00	6670	9	59	3615	253	0.118	4.366	0.070	39.29	0.63	98.4	467.8	67.5
PORTA	23E	shell	11	7/31/00	10/10/00	242	136	71	45400	1450	0.684	0.488	0.032	66.39	4.34	93.5	472.0	68.0
PORTA	23W	shell	11	2/21/00	4/20/00	6671	9.5	59	3816	197	0.092	3.380	0.052	32.11	0.49	98.5	467.8	59.5
PORTA	23W	shell	11	7/31/00	10/10/00	243	290	71	96808	1891	0.575	0.411	0.020	119.21	5.66	95.2	304.3	65.8
PORTA	24E	peat	12	2/21/00	4/20/00	6672	48	59	19282	358	0.269	1.561	0.019	74.94	0.89	98.8	751.2	28.0
PORTA	24E	peat	12	7/31/00	10/10/00	244	24	71	8012	95	0.065	1.415	0.012	33.96	0.28	99.2	689.6	28.6
PORTA	24W	peat	12	2/21/00	4/20/00	6673	28	59	11248	157	0.103	1.614	0.014	45.18	0.39	99.1	657.5	25.8
PORTA	24W	peat	12	7/31/00	10/10/00	245	59	71	19695	471	0.325	1.182	0.024	69.76	1.41	98.0	690.0	45.1

 Sample Area = 154 cm<sup>2</sup> (14.0 cm diameter)

 Assume BD = 0.05 g/cm<sup>3</sup> when not determined

Assume TP = 0.05% when not determined

APPENDIX D

## **Key Date Summary**

---

## **Key Date Summary for PSTA Field Activities: January 1999 – November 2000**

**PREPARED FOR:** Steve Gong/Bob Knight  
**PREPARED BY:** Jeff Madejczyk, Fran Bennett, Ellen Patterson  
**DATE:** December 21, 2000

### **January 1999**

01-05-99: Filled Porta-PSTAs with soils. Planted *Eleocharis cellulosa* into Porta-PSTAs (2 to 3 plant clumps per square meter).

01-06-99: Placed WCA-2A periphyton/bladderwort mix in all Test Cells and in all Porta-PSTA tanks except PP 21 and 22.

01-07-99: Installed aluminum scaffold boardwalks in Test Cells.

01-08-99: Porta-PSTA's filled to 50cm.

01-12-99: Valves opened at Test Cells. Weirs raised to 15.5'.

01-13-99: Porta-PSTA's 1, 4, 9, 10, 23, 24 drained and repaired for leaks.

01-14-99: Water turned on to Porta-PSTA's 1, 4, 10, 12, 23, and 24 to bring up water level. Water to all Porta PSTA's turned off at end of day. Test Cell weirs adjusted to 16.0 ft.

01-20-99: Staff gauges installed in Porta-PSTA's. Porta-PSTA's filled and flows turned off at end of day for leak testing. Weir heights of all Test Cells raised to 16.5'.

01-27-99: Test Cell weir heights lowered to 15.5'. Flow to Porta-PSTA 7 turned on for preliminary tracer study (250ml/min).

### **February 1999**

02-20-99: Plant material and substrate removed from Porta-PSTA's 16, 19, 20, 21 for leak repairs.

02-12-99: All Test Cell weir heights raised to 16.5'.

02-17-99: Weir height in Test Cell 8 lowered to 16.2' for feldspar deployment.

02-18-99: Weir height in Test Cell 8 raised to 16.5'. Fiberglass repair crew replaced Porta-PSTA's 20 and 21; inflows begun to these tanks. Porta-PSTA's 16 and 19 removed for repair by fiberglass repair crew.

02-22-99: Adjusted Test Cell weir heights to 16.05 in TC3, 16.12 in TC8, and 16.3 in TC13 to try to reach goal of 16.5 ft on staff gauge.

### **March 1999**

03-03-99: Substrate removed from Porta-PSTA 2 for leak repair. Porta-PSTA's 1, 3, 16, 19, 22 filled.  
Inflow to Head Tank stopped due to canal treatment.

03-17-99: Flow to Head Tank resumed. All Porta-PSTA's filled.

03-18-99: All Porta-PSTA's filled and valves then closed except PP 23.

03-19-99: Porta-PSTA 23 and Head Tank flows stopped. Feldspar deployed at end of east walkway in TC13.

03-23-99: Porta-PSTA's 19 and 20 drained and sand substrate added, then macrophytes planted. Tanks

refilled. Porta-PSTA's 16, 21, 23 and 24 drained.

03-24-99: Shellrock added to Porta-PSTA 16, peat added to Porta- PSTA 21. Macrophytes planted in Porta-PSTA 16 and water levels brought back up in both tanks.

03-25-99: Shellrock added to Porta- PSTA 23. Plants added and flow restarted. Test Cell 3 weir lowered to 16.0'.

03-29-99: Water not flowing from Head Cell to Test Cells, sampling event postponed until next day.

### **April 1999**

04-01-99: Porta-PSTA 2 replaced with new tank. Supplemental Braces installed on PP 23 and 24, PP 7, 10, 11, 13, and 14 re-glassed with new braces along rib. Shellrock substrate added to PP 2 and replanted with spike rush.

04-02-99: Outflow pipes on PP 3 and 7 changed to 30cm height. Outflow pipe missing from PP 1 so pipe from PP 23 moved to PP 11. Silicon cement used to fix leaking outflow points on PP 12, 13, and 14.

04-03-99: Add outflow pipe to PP 23 and started inflow. Reduced inflows on Porta-PSTA's 1-22 to the 45 setting on the inflow valve, PP 24 flow reduced. Inflow to head tank reduced to avoid overflow. Cleaned outflow tube on PP 3 to keep tank from overfilling.

04-07-99: Lowered water in PP 4 for leak repair.

04-08-99: Raised outflow point on PP 11 and 18 to the 60cm level.

04-09-99: Turned off flows to PP 4, 7, 11, 18 and 20 for leak test. Lowered weir in TC 3 by 1.875 in, in TC 8 by 1in and in TC 13 by 1in.

04-12-99: Restarted flows to tanks 4, 7, 11, 18 and 20 after leak test.

04-17-99: Changed outflow level in PP 1, 6, and 15 from 60cm to 30cm and flows reduced to 170ml/min.

04-19-99: Lowered outflow point in PP 18 to 30cm. Lowered weir in TC 3 to 15.3ft.

04-22-99: Lowered weir in TC 3 to a height above grate of 10.5in.

04-23-99: Drained PP 18 for repairs.

04-24-99: Flow shut off and water level dropped in PP 4 to fix leak

04-27-99: Lowered weirs in TC 8 and 13 by 0.10ft.

04-30-99: Set weir for TC 3 to 15.3ft.

### **May 1999**

05-04-99: Raised weir in TC 8 from 15.70ft to 15.75ft

05-05-99: Raised weir in TC 3 by 0.3 tenths and in TC 8 by 0.5 tenths.

05-17-99: Pump to take water to head tank at Porta-PSTA's stopped.

05-18-99: Repaired pump to head tank at Porta-PSTA's, flow resumed.

05-24-99: Leak in PP 11 caused water levels to drop, no sample collected.

05-27-99: Raised weir in TC 13 to 16.2ft in an attempt to reach cell water depth of 16.5ft. All Porta-PSTAs except PP 23 and 24 partially drained for repairs and feldspar addition.

05-29-99: Replaced drain plugs and outflow drains in all Porta-PSTA's, then filled all tanks back to operational level. Flow to TC 3 shut off for approximately two hours for repairs.

### **June 1999**

06-01-99: Lowered water level in PP 22 to repair leak.

06-02-99: Repaired leak in PP 22.

06-03-99: Raised outflow points in PP 1, 6, and 15 to 60cm level and set flows to 320ml/min.

06-09-99: Flow to Porta-PSTA head tank stopped between 15:00 to 15:30, head tank dry.

06-10-99: Raised outflow levels of tanks 1, 6, and 15 to 70cm. Pump to Porta-PSTA head tank still not operational.

06-11-99: Set up temporary pump and garden hose to supply water to Porta-PSTA head tank over the weekend.

06-17-99: Installed new larger temporary pump to supply water to Porta-PSTA head tank. District pumps still not operational.

06-18-99: Flow to head tank from temporary pump too low. Assembled new inflow tube for hose to keep it from clogging. Flow to head tank via temporary pump restored.

06-21-99: Temporary pump to head tank lost prime over the weekend. Re-established flow to head tank at 08:45.

06-22-99: District pumps to supply water to Porta-PSTA head tank back online.

06-28-99: District pump to Porta-PSTA head tank not functioning. Temporary pump still working, head tank has water, all Porta-PSTA's have flow.

### **July 1999**

07-01-99: Increased flows in PP 1, 6, and 15 to 370ml/min. District pump started up and began adding water to head tank.

07-15-99: District pump to Porta-PSTA head tank not running. Temporary pump running fine, head tank full.

07-21-99: District pump to Porta-PSTA head tank not running.

07-26-99: District pump to Porta-PSTA head tank still not running.

07-29-99: District pump to Porta-PSTA head tank ran on and off during the day.

### **August 1999**

08-02-99: District pump to Porta-PSTA head tank up and running.

08-03-99: Removed small temporary Porta-PSTA head tank pump from canal now that district pump is on-line.

08-05-99: District pump down for repairs, back online at 12:45. Set inflows for tanks 1, 6, and 15 to 430ml/min. Pulled 11 cattail seedlings from PP 11.

### **September 1999**

09-02-99: Raise weir in TC 3 from 16.65ft to new height of 16.8ft.

09-10-99: Changed orifice on TC 3 to 1.5in.

### **October 1999**

10-01-99: Adjusted inflow pipe on TC-13 because it had been leaking water. Repaired it so that water is flowing through distribution pipe once again.

10-07-99: Increased flows in Porta-PSTA's to 1200ml/min in tanks 23 & 24, 800ml/min in tanks 2, 13, & 16

400ml/min in all other tanks in an attempt to keep flows from stopping between calibration days.

Removed screens from inflow manifold line. Changed orifice in TC 3 from 1.5in to 1in.

### **November 1999**

11-04-99: Lowered weir in TC 3 to 16.00ft, orifice changed to 0.75in. Lowered outflow point on Porta-PSTA's 1, 6 & 15 to 30cm.

11-23-99: Outflow valve on Porta-PSTA NE line was changed out, water to Porta-PSTA's was shut off for 1 hr.

### **December 1999**

12-02-99: Lowered weir in TC 3 to 15.3ft. Lowered flow in Porta-PSTA's 1, 6, & 15 to 80ml/min.

### **January 2000**

01-06-00: Lowered weir for TC 3 to 14.8ft, changed orifice to 1.00in. Lowered outflow point on Porta-PSTA's 1, 6, & 15 to 10cm and increased flows to 260ml/min.

01-13-00: Used siphon to lower water levels in tanks 2, 13, & 16 to 30cm and set flows to 800ml/min. Lowered weir in TC 8 by 12in and shut off flow to TC 13. Shut off flows in Porta-PSTA's 4, 7, 8, 9, 11, 18, & 20 to begin batch experiment.

01-27-00: Re-circulation pumps were added to tanks 4, 7, 8, 9, 11, 18, & 20 as part of the batch experiment.

### **February 2000**

02-03-00: Lowered weir in TC 3 by 0.1ft. Set flows in Porta-PSTA's 1, 6, & 15 to 205ml/min.

02-14-00: Lowered weir in TC 3 by 0.75ft in an attempt to reach target water depth of 0.2ft. Lowered weir in TC 8 by 0.4ft in an attempt to reach target water depth of 1.0ft.

### **March 2000**

03-06-00: Shut off inflow and lowered weir in TC 3 to 14.2 ft to drain cell for dry down experiment.

03-07-00: Lowered weir in TC 13 to 14.5 ft to drain cell.

03-14-00: Cleared vegetation and dug a hole near TC 13 outflow pipe to facilitate drying out the cell.

03-16-00: Re-circulation pumps removed from PP 4, 7, 8, 9, 11, 18 & 20. Shut off inflows to PP 1, 6, 15, 21, & 22. Use siphon to drain water from PP 4, 7, 8, 9, 11, 18, 20, 21, & 22. Set flows for all remaining PP to 250ml/min and 750ml/min for 23 & 24.

03-20-00: Harvest spike rush from PP 9, 11, & 18 and save to replant tanks later. Harvest periphyton mat from PP 4, 7, 8, & 20 and save to restock PP later. Drained PP 4, 7, 8, 20, 21, and 22. Remove sediment from PP 4, 7, & 8.

03-21-00: Remove sediment from PP 21 & 22. Rinse PP 4, 7, 8, 20, 21, & 22 with HCl. Counted and removed snails from PP 1, 2, 6, 10, 12, 13, 14, 17, 23, & 24.

03-22-00: Load lime rock sediment into PP 4, 7, & 8 and rinse lime rock three times before bringing water levels up to just above the sediment. Bring water level in PP 20 up to just above sediment. Plant spike rush in PP 1, 4, 6, 7, 8, 19, & 20. Add approximately 1.5 gallons of periphyton to PP 4, 7, 8, 20, 21, & 22. Install re-circulation pumps on tanks 2, 13, & 16. Pulled cattail seedlings: PP3 (1), PP6 (8), and PP13 (2). Loosen lowest outlet point on PP 1, 6, & 15 to allow them to dry out. Herbicide applied to vegetation in TC 13.

03-27-00: Install Aquamat in PP 22. Applied approximately 9 lbs of hydrated lime to PP 9, 11, & 18. Dug trench and cleaned out screen over outflow pipe in weir box in TC 13 to facilitate drying of cell.

### **April 2000**

04-03-00: Installed screen over intake of re-circulation pumps in PP's 2, 13, & 16 to keep them from clogging with snails. Add water to tanks 4, 7, 8, 6, & 15 to keep plants alive.

04-07-00: Raised weir to 14.8ft in TC 13. Clear all dead vegetation from TC 13 and turned on water with 1in

orifice.

04-10-00: Turned off water to TC 13, cell had about 3in of water. Added hydrated lime to 1/3 of TC 13 . Added water to tanks 1, 6, & 15 to keep plants alive.

04-11-00: Added lime to final 2/3 of TC 13 (68 [50 lb.] bags were spread evenly through out the cell for a total of 3400 lbs.)

04-12-00: Raise weir to 15.0 ft and turned on water. Planted spike rush in TC 13. Broadcast approximately 126 gallons of periphyton into TC 13.

04-13-00: Lowered outflow point of PP 21 & 22 to 10cm level. The 10cm level accounts for the lack of sediment in the tanks. Because the tanks have no sediment in them there is approximately 30 cm of water in the tanks. All other tanks have outflow points at 30 cm level. Turned on inflows to tanks 4, 7, 8, 9, 11, 18, 20, 21, & 22. Planted six clumps of Eleocharis each into PP's 9, 11, & 18.

04-17-00: Adjusted outflow point of PP 20 to 30cm level.

### **May 2000**

05-01-00: Re-circulation pump in PP 2 not functioning properly, removed to exchange for a new one. Drew down water with siphon in PP 11 & 20 to level below that of metal support brackets to allow for leak repair.

05-02-00: Fixed leaks with epoxy in PP 11 & 20, brought water levels back up to 30cm level.

05-04-00: Water in tanks 11 & 20 left on by mistake, flows set back to 350ml/min. Install new re-circulation pump on PP 2.

05-08-00: Water added to PP 1, 6, & 15 to keep plants alive.

05-09-00: Flows in PP 1, 6, & 15 left on by mistake, water leaving tanks through lowest outflow point. Flows shut off and water let out of tanks through lowest outflow point.

05-15-00: Water in PP 1, 6, & 15 turned on and set to 350ml/min.

05-18-00: Turn on water in TC 3 with 1in orifice. Replace bucket and black plastic tube back in outflow pipe, raised weir to 15.5ft. Removed 1 cattail plant from PP 6, 16, & 19.

05-19-00: Raise outflow pipe on PP 1, 6, & 15 to 30 cm level.

05-25-00: Aquamat in PP 22 had drifted out of place. Moved it back into its original position. Flows in Porta-PSTA were increased from 350ml/min (750ml/min for PP 23 and 24) to 400ml/min (1200ml/min for PP 23 and 24) in an attempt to keep flows from stopping between calibration days. Completed depth survey at TC 3, 8, & 13 consisting of 40 depth measurements for each cell (10 measurements along each side of the 1/3 and 2/3 walkways). Used average depth from survey to make adjustments to weirs in an attempt to reach target water depth of 1.0ft in each test cell. For TC 3 average depth was 1.192 ft and the water was still ~0.1ft below the v-notch. Weir was lowered by 0.3ft to a new height of 15.2ft. For TC 8 the average depth was 0.798ft. Weir was raised by 0.2 ft of a new height of 15.00ft. For TC 13 the average depth was 0.84ft. Weir was raised by 0.16ft to a new height of 15.15ft.

### **June 2000**

06-05-00: Aquamat in PP 22 drifted out of place, moved back to its original position. Drew down water in PP 11 to repair a leak in tank.

06-08-00: Aquamat in PP 22 drifted out of place, moved back to its original position. Changed orifice in TC 3 from 1in. to 1.5in.

### **July 2000**

07-12-00: Aquamat in PP 22 drifted out of place, moved back to its original position. Collected snails from PP 1 and 10.

07-13-00: Collect snails from PP 2 through 9 and 11 through 15.

07-24-00: Added ~1/2 gallon of Utricularia to PP 21. Utricularia was taken from West walkway of TC 3 and added to PP 21 in about 2 gallons of water.

07-27-00: Used sprinkler head weights with zip-ties to hold down Aquamat in its proper position. Collected snails from PP 16 through 21. Removed blue outflow tube from PP 21 and replaced with a more flexible tubing in an attempt to fix problem with higher “recorded” outflows.

07-31-00: Deployed larger sediment traps in PP's (1 in each tank) and STC's (3 along each walkway).

### **August 2000**

08-03-00: Cut a notch in outflow collection pipe in front of PP 21 (outflow tube was being pushed up by outflow collection pipe, causing water to pool up, which in turn altered our outflow measurements).

08-10-00: Entered TC 3 to clear snails, vegetation, and algae from holes in outflow stand pipes because water level are getting too deep. Repaired hole in inflow tube for TC 13

08-28-00: Installed new re-circulation pumps on PP 13 & 16.

08-31-00: Entered TC 3 to clear holes in outflow stand pipes, water levels too deep.

### **September 2000**

09-06-00: Installed water level recorders onto outflow boxes of Field Scale (FS) Cells 1, 2 and 3.

09-07-00: Added 5 bags of dried periphyton to PP's 21 and 22 each for decomposition study. Made cement bucket weights to use in FS cells to hold hose from inflow pumps in place.

09-08-00: Installed 1 water level recorder in FS inflow canal and 1 in outflow canal. Placed a PVC ‘T’ on end of FS pump hose, in order to disperse flow so it would not be as erosive and added bucket weights to end of hose.

09-13-00: Inflow to TC3 turned off to change orifice from 1.5 in to 1 in. Lowered weir to 14.95 ft in an attempt to reach target water level elevation of 15.0 ft. Could not get water turned back on, SFWMD is checking on it. Coastal Revegetation was on site to herbicide cattails along bank of TC's 3, 8, & 13 (did not enter cell, only what they could reach from the bank) and also vegetation around inflow pipes, weir boxes, and walkways to allow for clear paths when taking field readings.

09-15-00: Weir heights in Field Scale Cells raised to 3'.

09-18-00: Power outage at Porta-PSTA site. Head tank emptied. Temporary pumps installed to supply head tank with water from canal. Flow to Porta-PSTA's resumed. Recirculation pumps in PP2 and PP16 off due to power outage; recirculation pump in PP13 working. Water to TC3 still not on.

09-19-00: Power restored to Porta-PSTA site. Field Scale weir heights re-set to 2'.

09-20-00: Sonde in Head Cell not communicating with computer for data download.

09-21-00: Water collected at Field Scale site for lithium tracer study.

09-25-00: Rain gauge installed at Field Scale site. Pumps 1 and 2 were found off and restarted. Pump 3 also off; not restarted due to low hydraulic fluid and gas level. Water on at TC3 still slightly overflowing weir.

09-27-00: Significant amount of leakage visualized through inflow (south) berm of Field Scale cells.

09-28-00: Coastal Revegetation on site at Test Cells to do second herbicide application. Weir in TC3 lowered as much as possible to help cell to dry- decision made to enter dry-out phase. Site visit by rep from Aquamat. Head cell Sonde still problematic in downloading data; removed and brought back to the office to be sent for repair.

### **October 2000**

10-02-00 through 10-04-00: Final Porta-PSTA quarterly event.

10-10-00: Sediment traps collected at Porta-PSTA's and Test Cells. Sonde from TC east boardwalk (Sonde 5) not calibrating and respective datalogger not downloading properly. Sonde removed and taken back to office to troubleshoot.

10-12-00: Field Scale cells measured for boardwalk placement. FS Cell 1: 210' x 1040' (east side)(1043' west side); FS Cell 2: 218' (including inner berms which average 20' wide) x 1025'; FS Cell 3: 215' x 1038'. Met with Bagley Environmental and Planting Services to discuss *Eleocharis* planting. Decomposition study employing 1¼" PVC tubes, 15 cm length, begun at Porta-PSTA site. Tubes all deployed at 2/3 point in PP21.

10-14-00: Second set of water collected at Field Scale site for phosphorus background levels. Sonde 5 found to have had a cable problem; new cable attached and Sonde deployed in TC13E.

10-24-00: Sediment traps re-deployed in Test Cells. Final decomposition bag retrieved from Porta-PSTA's.

10-27-00: Pump 1 at Field Scale site not running, could not start. Pump 2 running fine. Pump 3 running but drain plug in bottom of pump will not stay in place. Pump left running (and leaking).

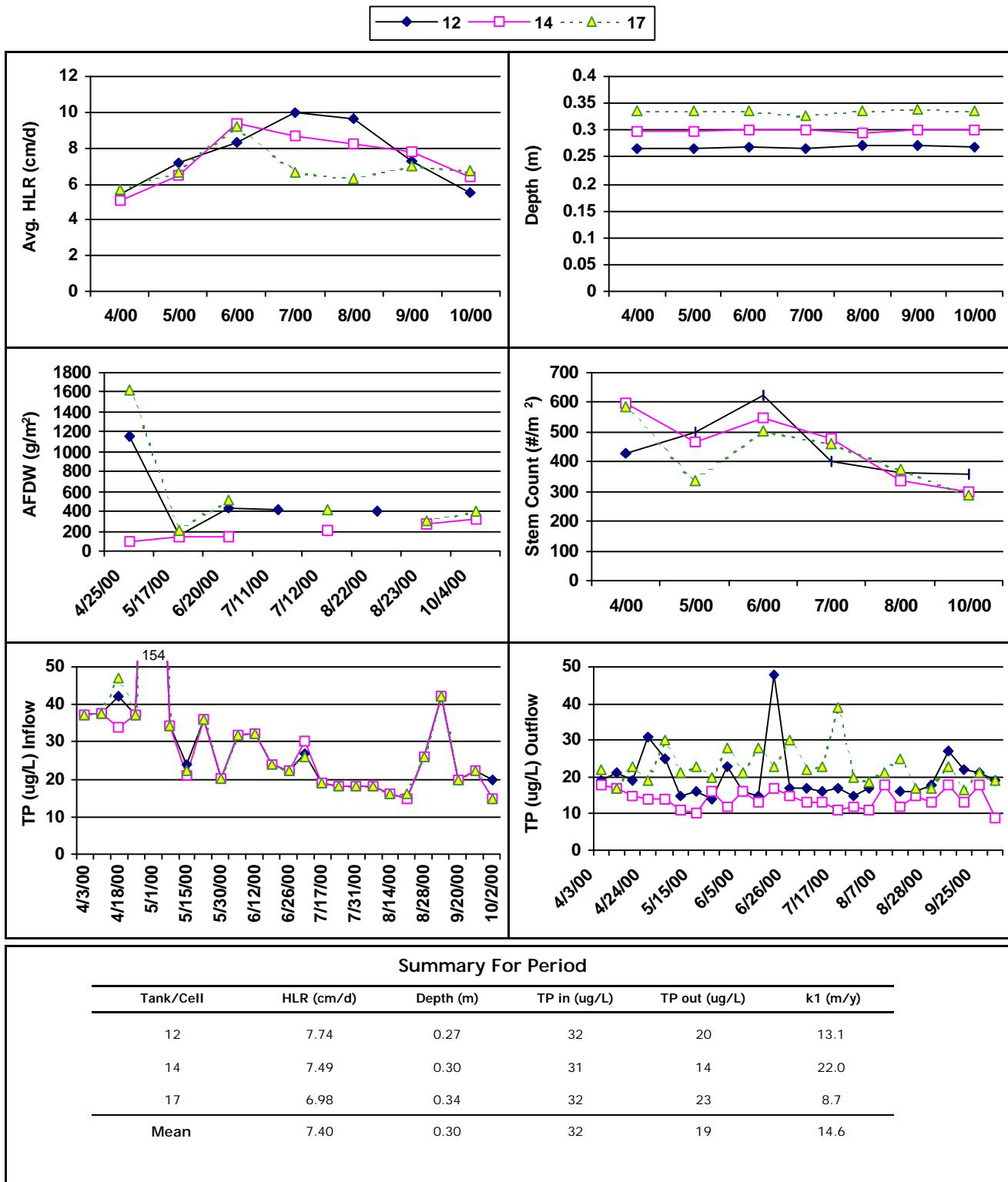
APPENDIX E

## **Data Trend Charts**

---

# PSTA Research and Demonstration Project

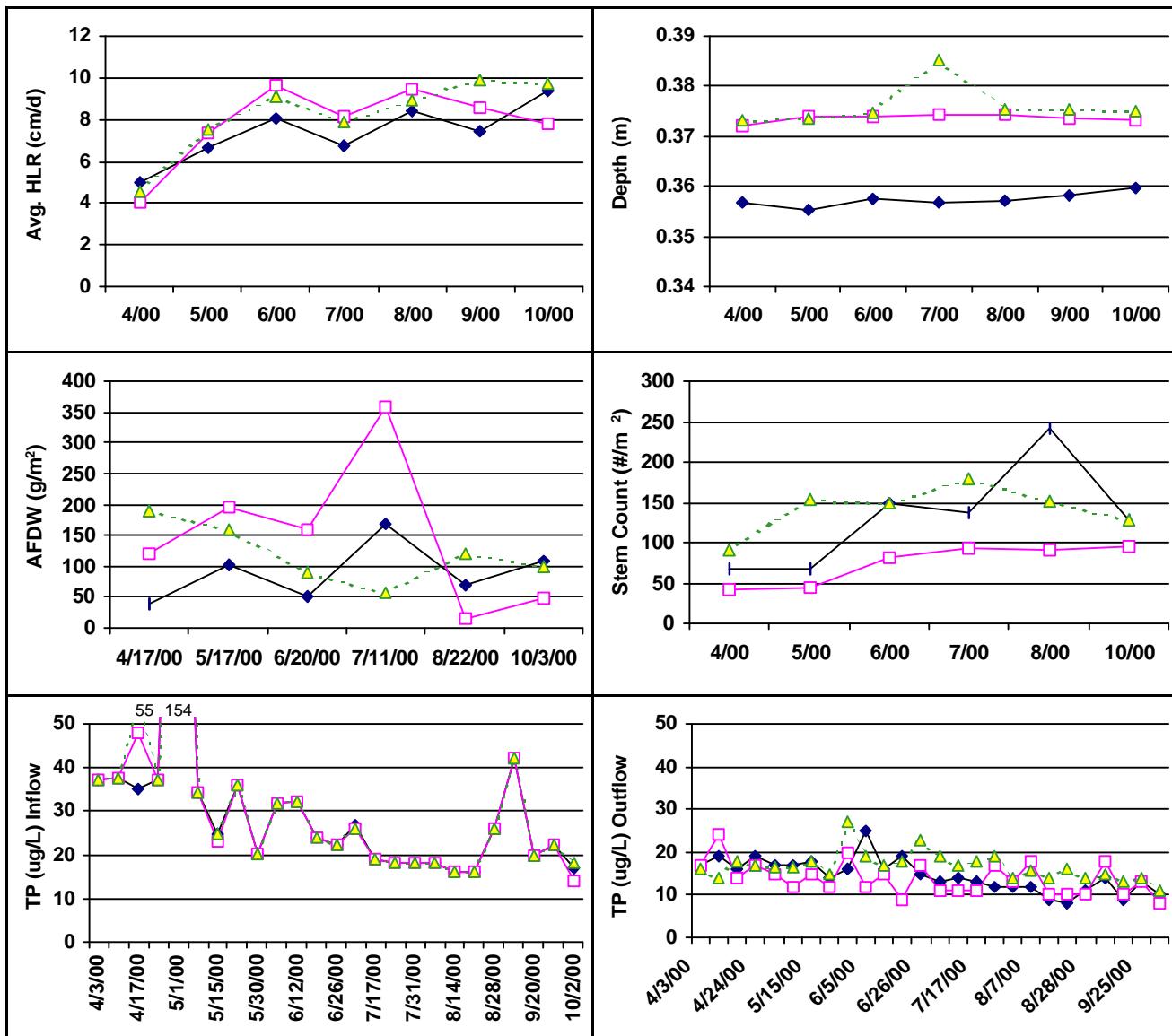
Treatment:	PP-3	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	12, 14, 17	Plants:	yes	Other:	
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	peat		



# PSTA Research and Demonstration Project

Treatment:	PP-4	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	3, 5, 10	Plants:	yes	Other:	
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	shellrock		

—♦— 10 —□— 3 —▲— 5



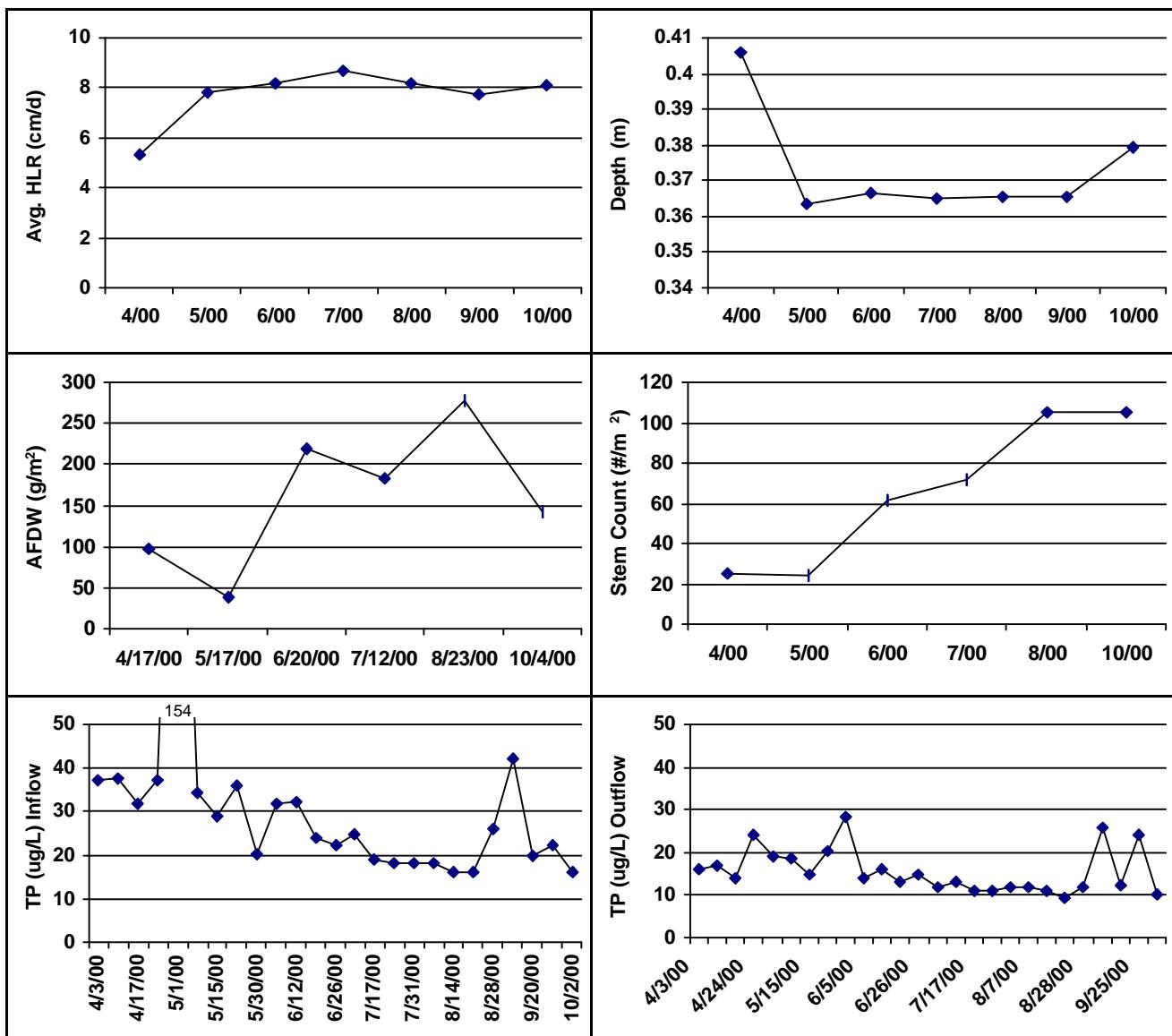
## Summary For Period

Tank/Cell	HLR (cm/d)	Depth (m)	TP in (ug/L)	TP out (ug/L)	k1 (m/y)
10	7.10	0.36	31	15	20.0
3	7.77	0.37	32	14	23.6
5	7.94	0.38	32	17	19.1
Mean	7.60	0.37	32	15	20.9

# PSTA Research and Demonstration Project

Treatment:	PP-7	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	19	Plants:	yes	Other:	
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	sand		

—♦— 19

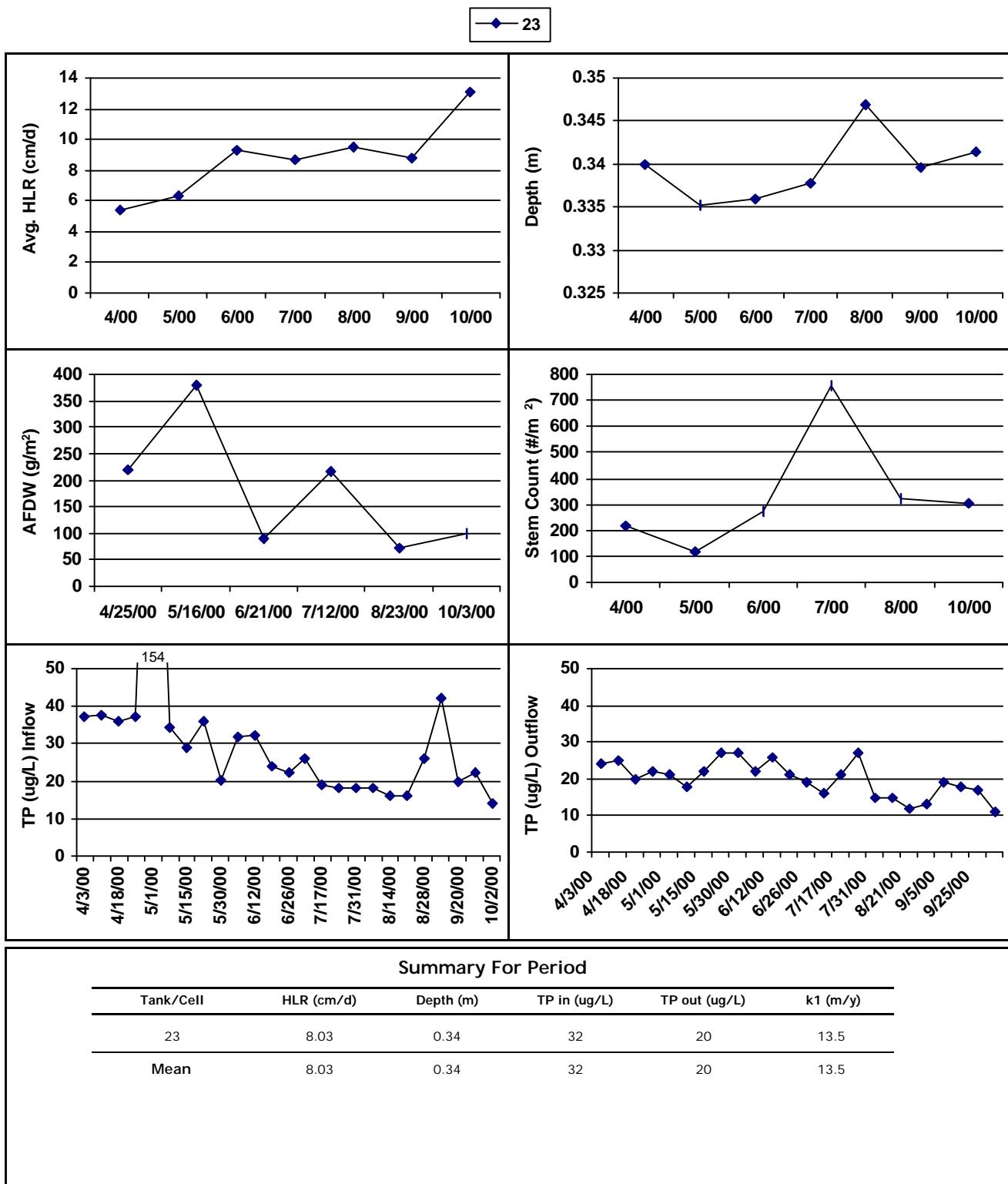


## Summary For Period

Tank/Cell	HLR (cm/d)	Depth (m)	TP in (ug/L)	TP out (ug/L)	k1 (m/y)
19	7.58	0.37	31	16	19.3
Mean	7.58	0.37	31	16	19.3

# PSTA Research and Demonstration Project

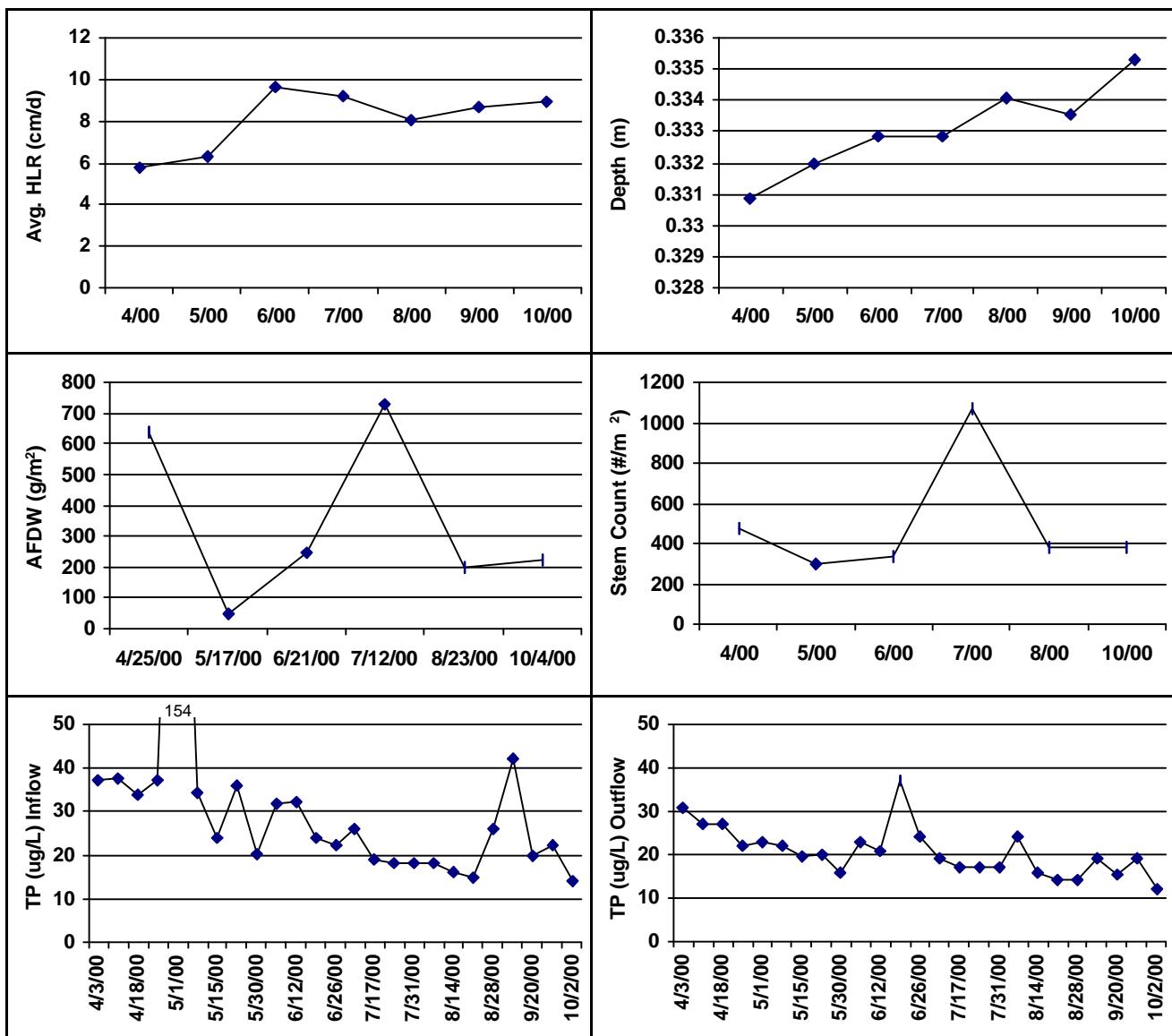
Treatment:	PP-11	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	23	Plants:	yes	Other:	
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	3 x 6 m (18m <sup>2</sup> )	Soil:	shellrock		



# PSTA Research and Demonstration Project

Treatment:	PP-12	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	24	Plants:	yes	Other:	
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	3 x 6 m (18m <sup>2</sup> )	Soil:	peat		

—♦— 24

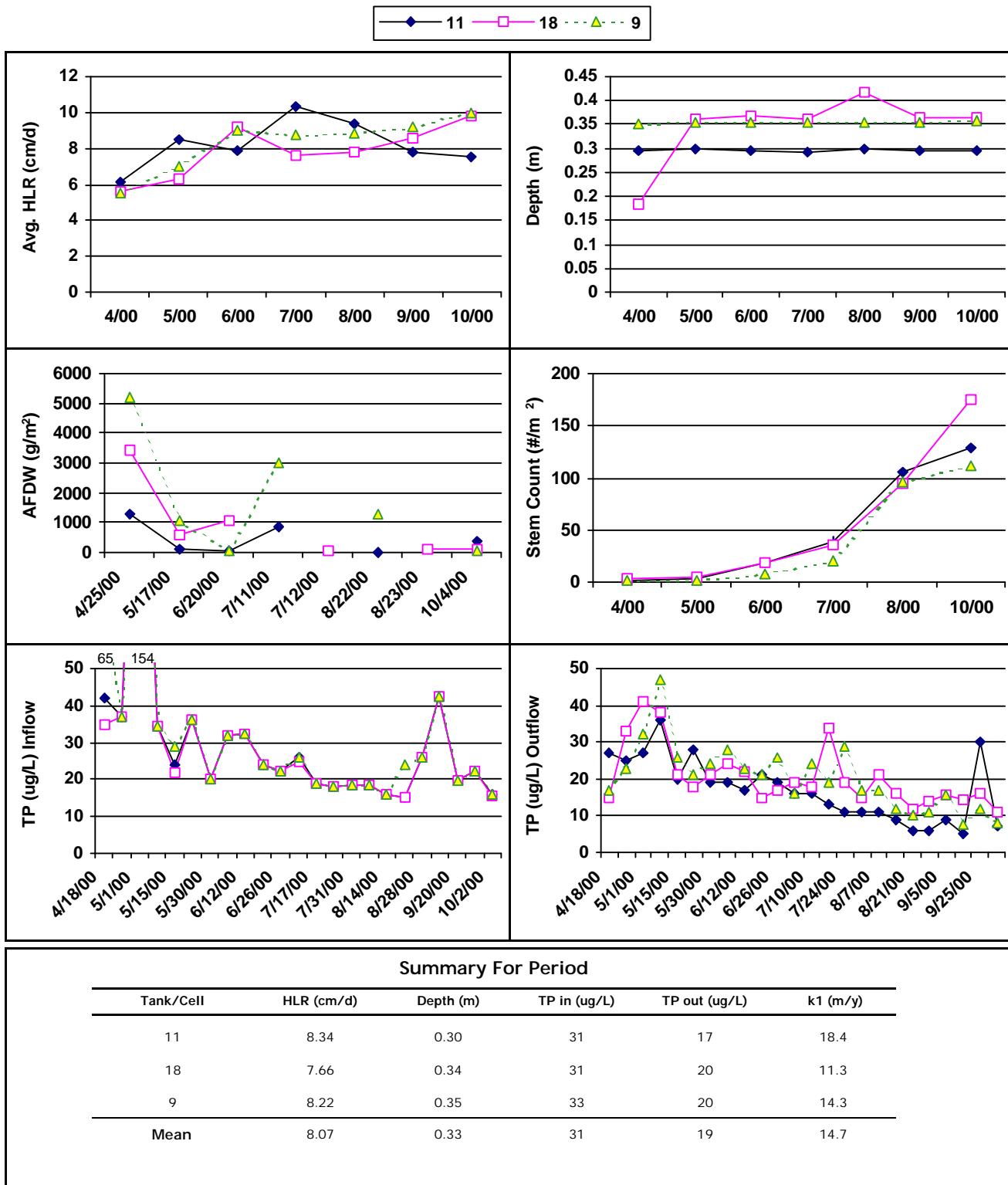


## Summary For Period

Tank/Cell	HLR (cm/d)	Depth (m)	TP in (ug/L)	TP out (ug/L)	k1 (m/y)
24	7.87	0.33	31	21	11.9
Mean	7.87	0.33	31	21	11.9

# PSTA Research and Demonstration Project

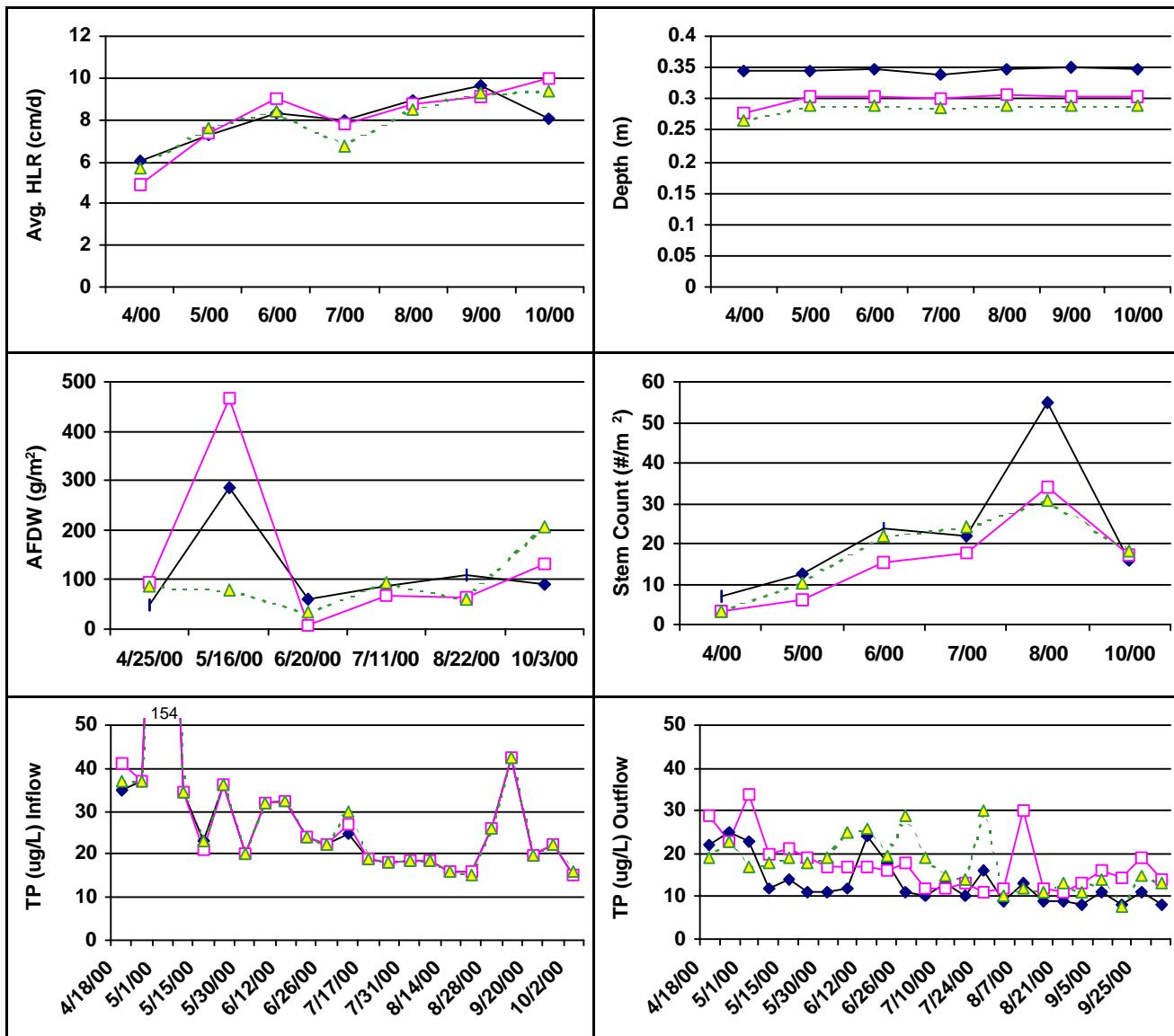
Treatment:	PP-13	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	9, 11, 18	Plants:	yes	Other:	
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	peat amended with CaOH		



# PSTA Research and Demonstration Project

Treatment:	PP-14	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	4, 7, 8	Plants:	yes	Other:	
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	lime-rock		

—●— 4 —□— 7 —▲— 8

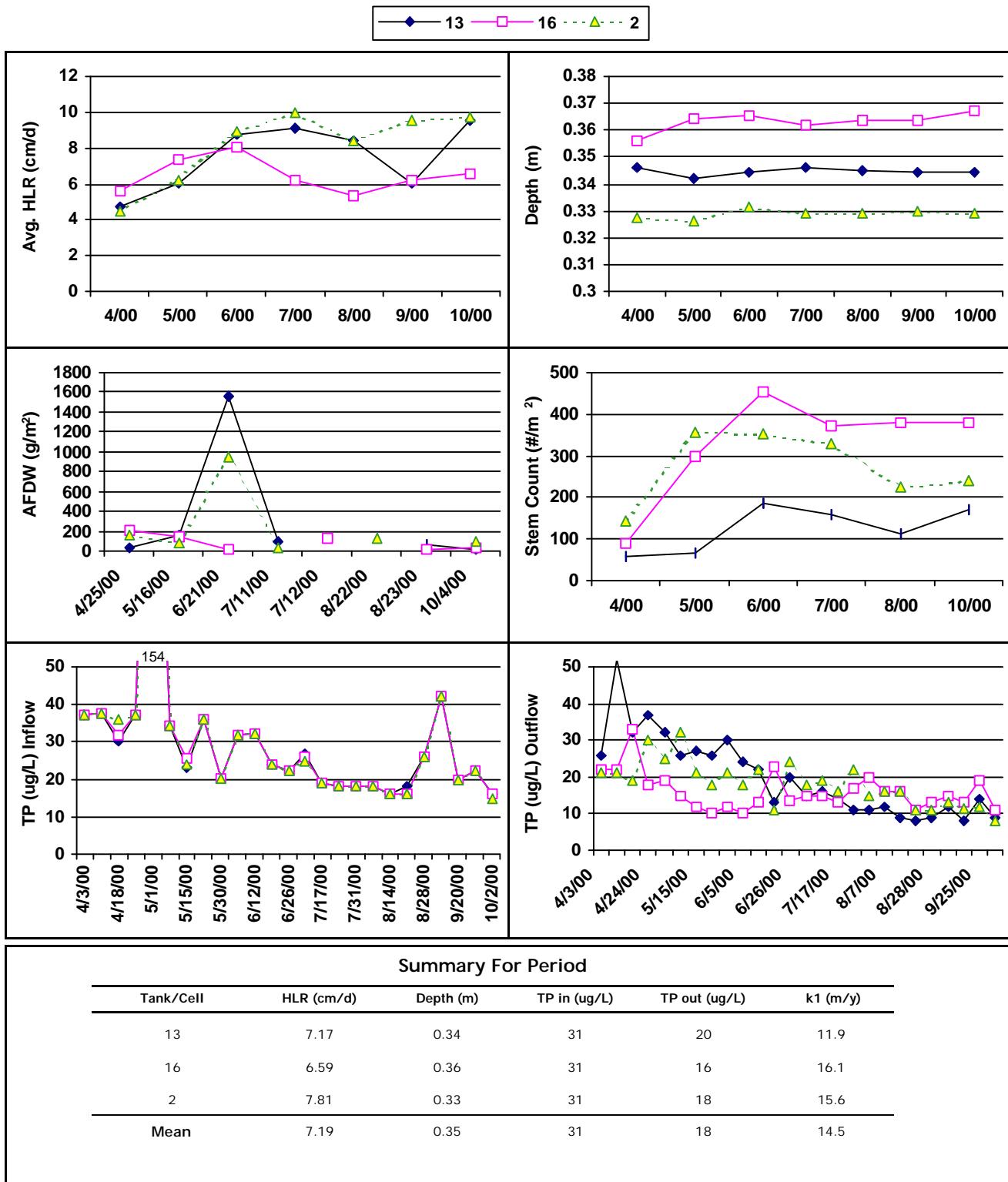


Summary For Period

Tank/Cell	HLR (cm/d)	Depth (m)	TP in (ug/L)	TP out (ug/L)	k1 (m/y)
4	8.06	0.35	31	13	24.7
7	8.05	0.30	31	18	16.7
8	7.86	0.29	31	17	16.6
Mean	7.99	0.31	31	16	19.3

# PSTA Research and Demonstration Project

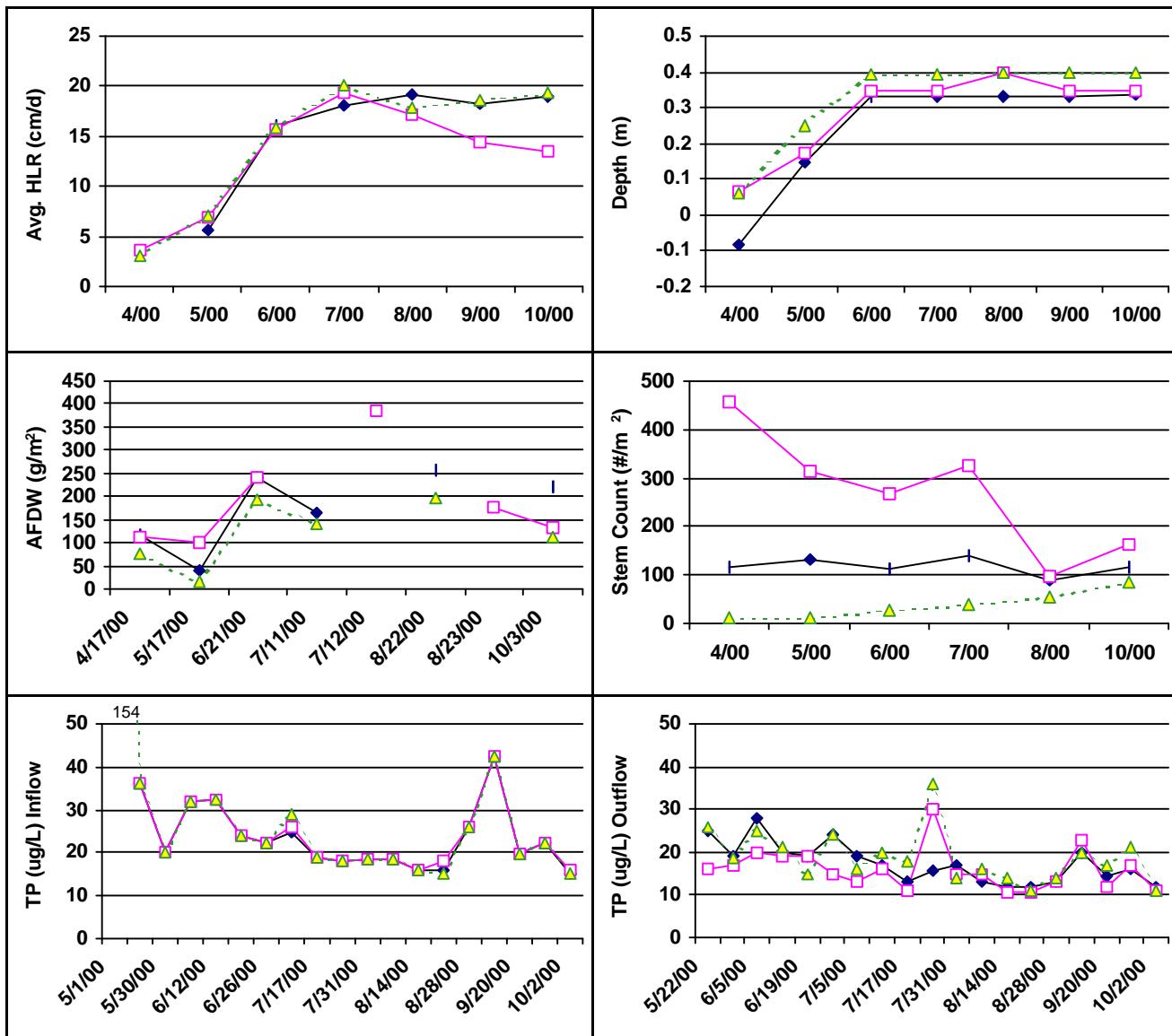
Treatment:	PP-15	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	2, 13, 16	Plants:	yes	Other:	
Research Scale:	Porta-PSTA	Recirculation:	yes		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	shellrock		



# PSTA Research and Demonstration Project

Treatment:	PP-16	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	1, 6, 15	Plants:	yes	Other:	dry-out
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	shellrock		

—●— 1 —□— 15 —▲— 6

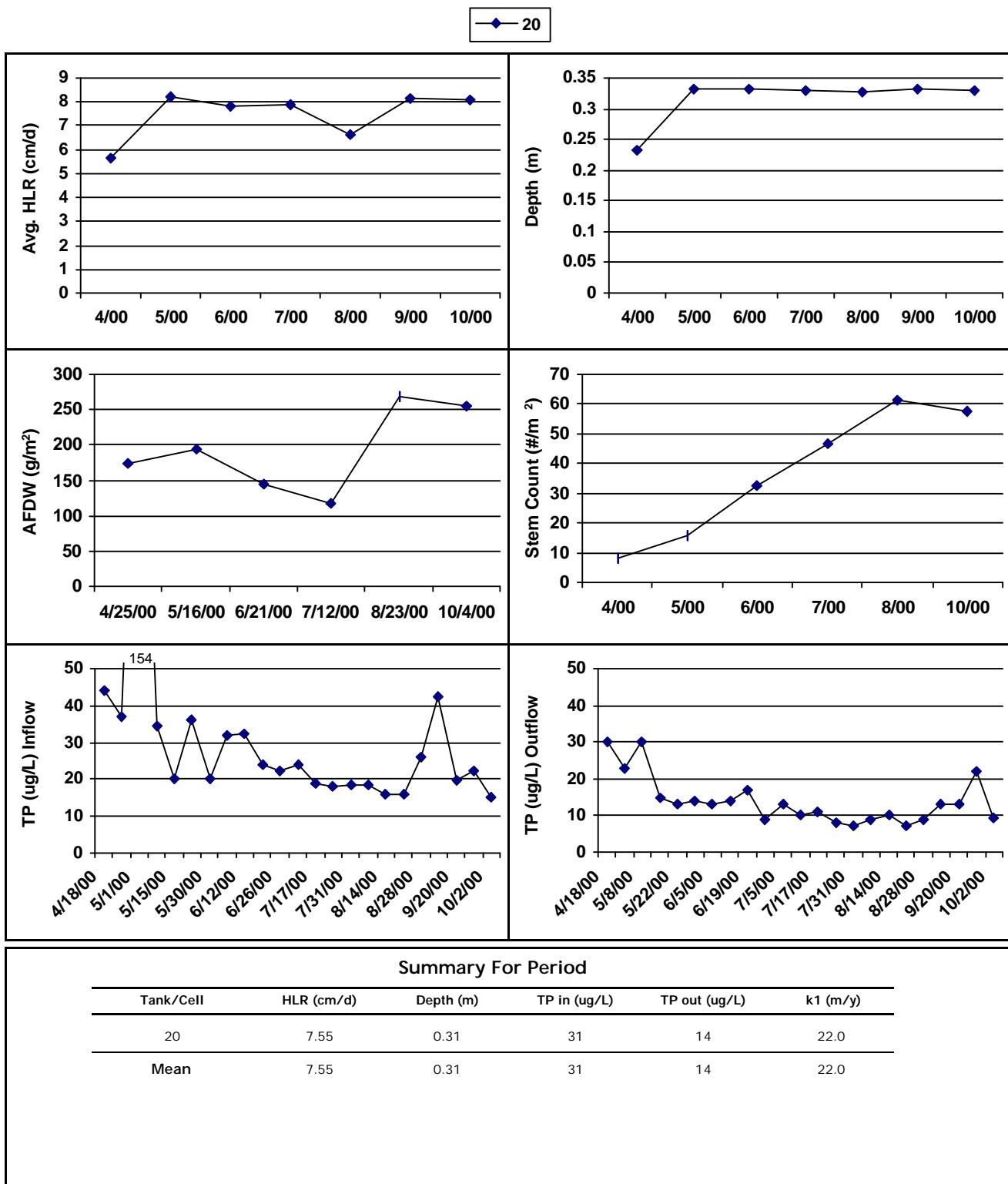


Summary For Period

Tank/Cell	HLR (cm/d)	Depth (m)	TP in (ug/L)	TP out (ug/L)	k1 (m/y)
1	15.46	0.28	24	17	17.2
15	14.27	0.28	24	16	20.7
6	15.54	0.34	31	19	27.4
Mean	15.09	0.30	26	17	21.8

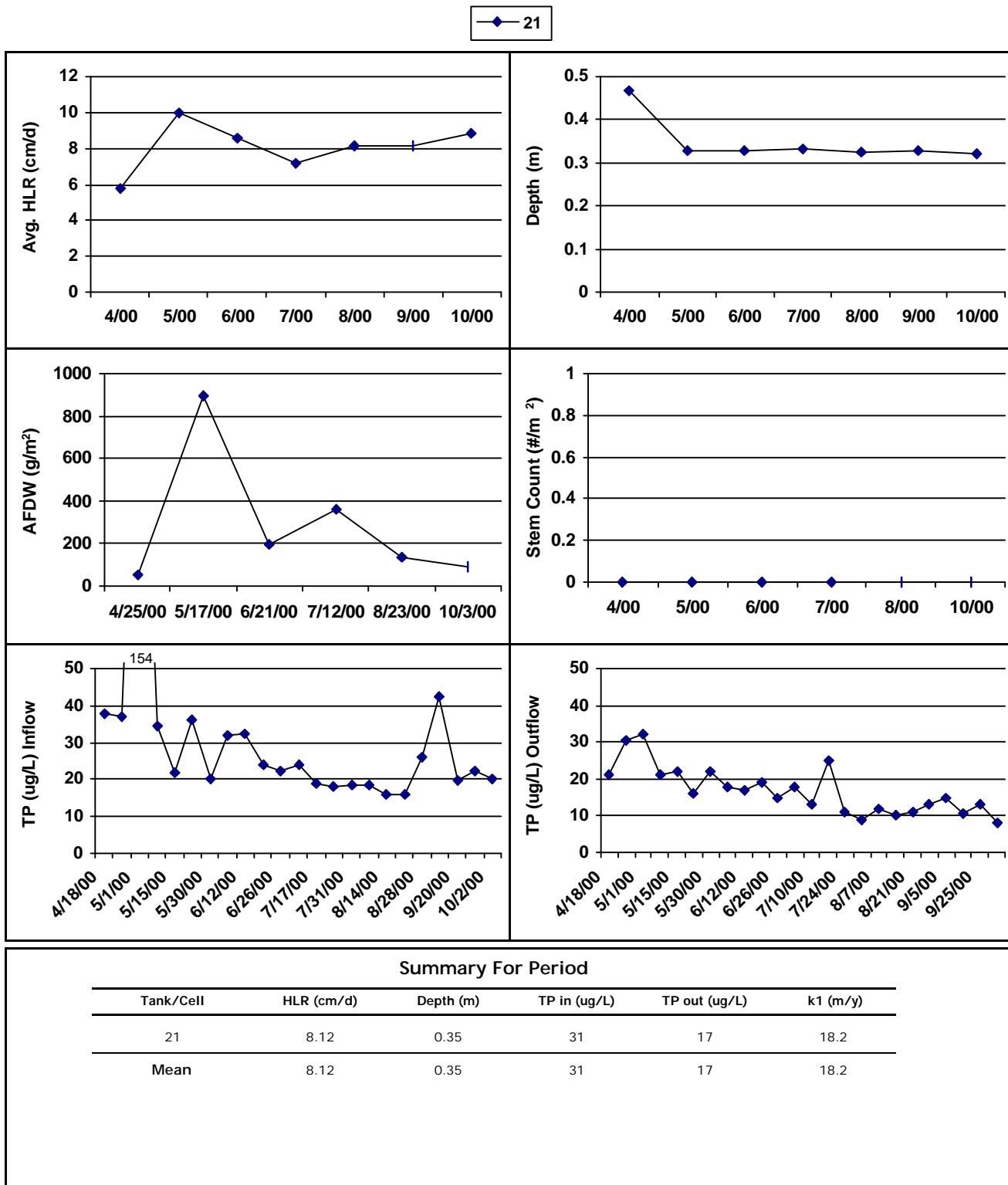
# PSTA Research and Demonstration Project

Treatment:	PP-17	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	20	Plants:	yes	Other:	
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	acid washed sand		



# PSTA Research and Demonstration Project

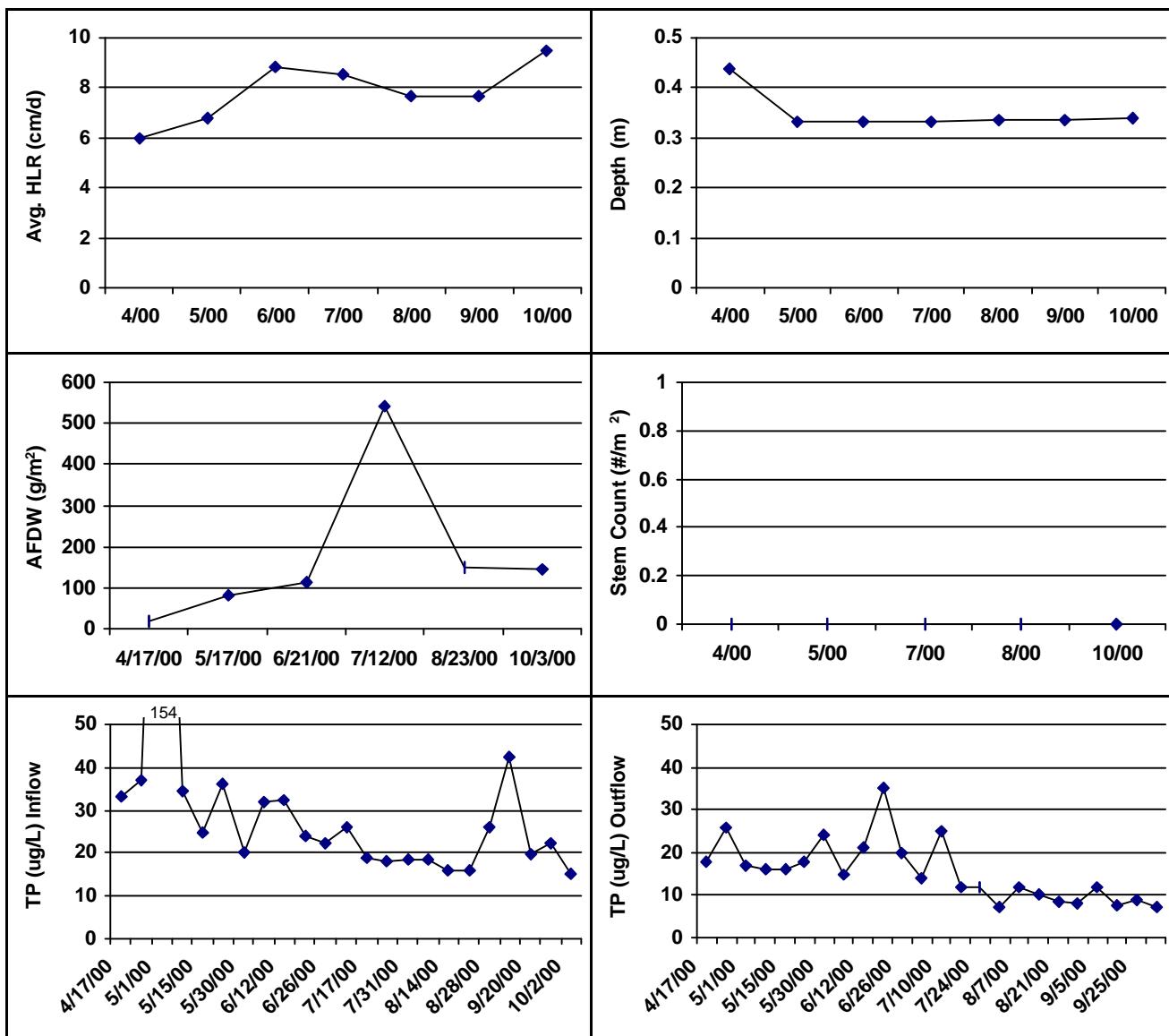
Treatment:	PP-18	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	21	Plants:	no	Other:	
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	none		



# PSTA Research and Demonstration Project

Treatment:	PP-19	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	22	Plants:	no	Other:	aquamat
Research Scale:	Porta-PSTA	Recirculation:	no		
Mesocosm Size:	1 x 6 m (6m <sup>2</sup> )	Soil:	none		

—♦— 22



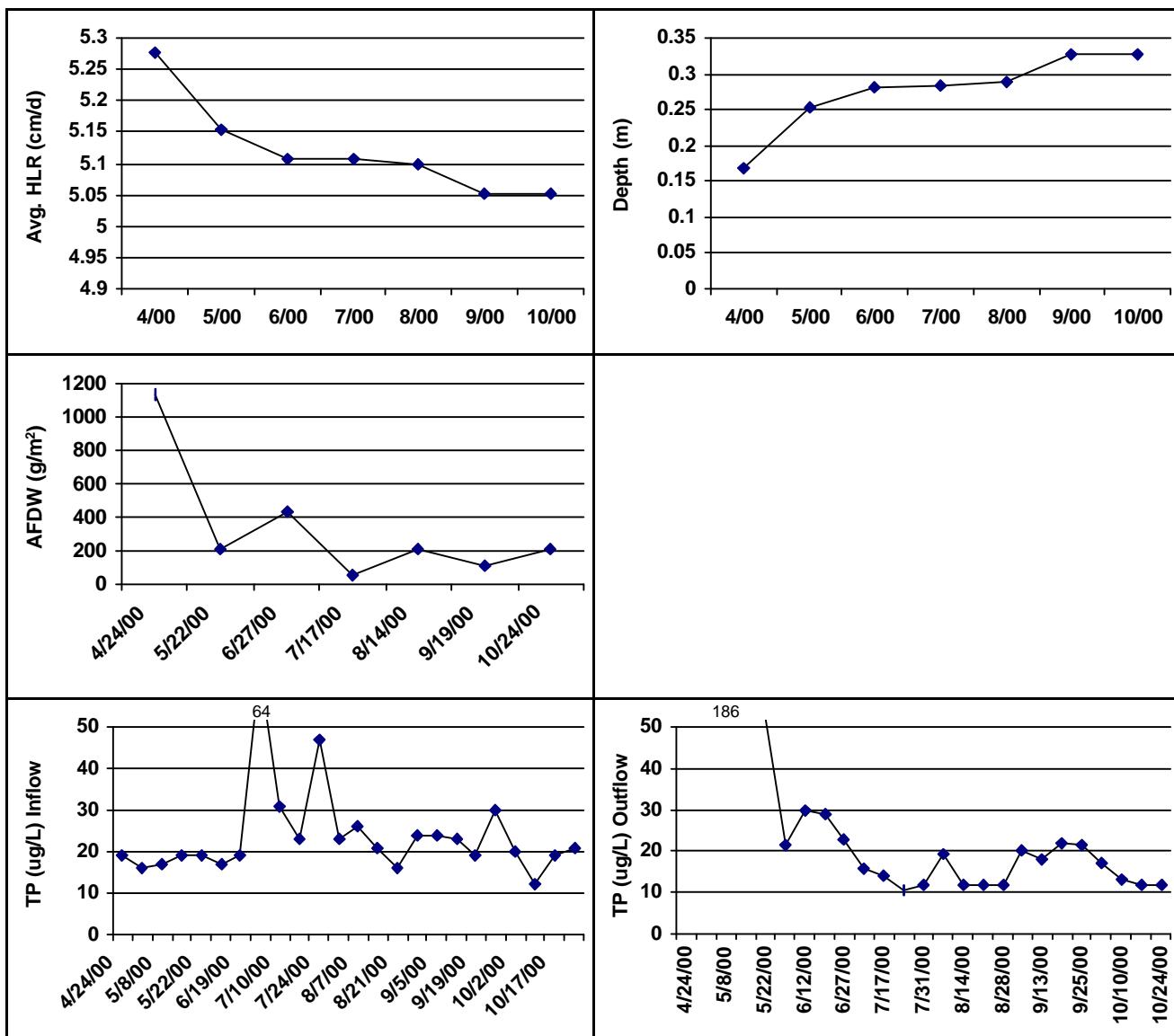
## Summary For Period

Tank/Cell	HLR (cm/d)	Depth (m)	TP in (ug/L)	TP out (ug/L)	k1 (m/y)
22	7.59	0.35	31	15	19.1
Mean	7.59	0.35	31	15	19.1

# PSTA Research and Demonstration Project

Treatment:	STC-4	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	13	Plants:	yes	Other:	
Research Scale:	Test Cell	Recirculation:	no		
Mesocosm Size:	28 x 80 m (2240m <sup>2</sup> )	Soil:	peat amended with CaOH		

—♦— 13



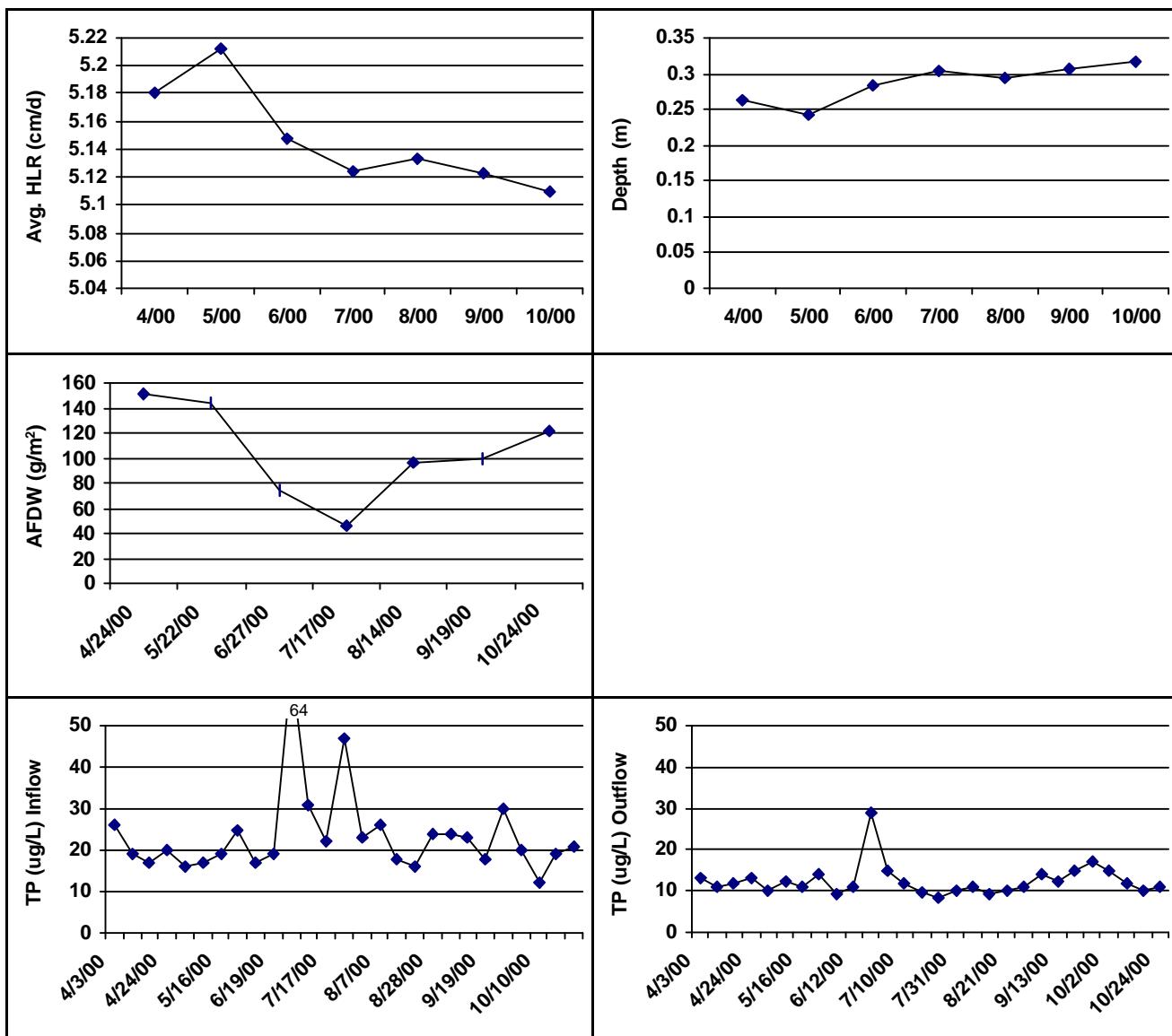
## Summary For Period

Tank/Cell	HLR (cm/d)	Depth (m)	TP in (ug/L)	TP out (ug/L)	k1 (m/y)
13	5.12	0.28	24	34	-7.0
Mean	5.12	0.28	24	34	-7.0

# PSTA Research and Demonstration Project

Treatment:	STC-5	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	8	Plants:	yes	Other:	
Research Scale:	Test Cell	Recirculation:	no		
Mesocosm Size:	28 x 80 m (2240m <sup>2</sup> )	Soil:	shellrock		

—♦— 8



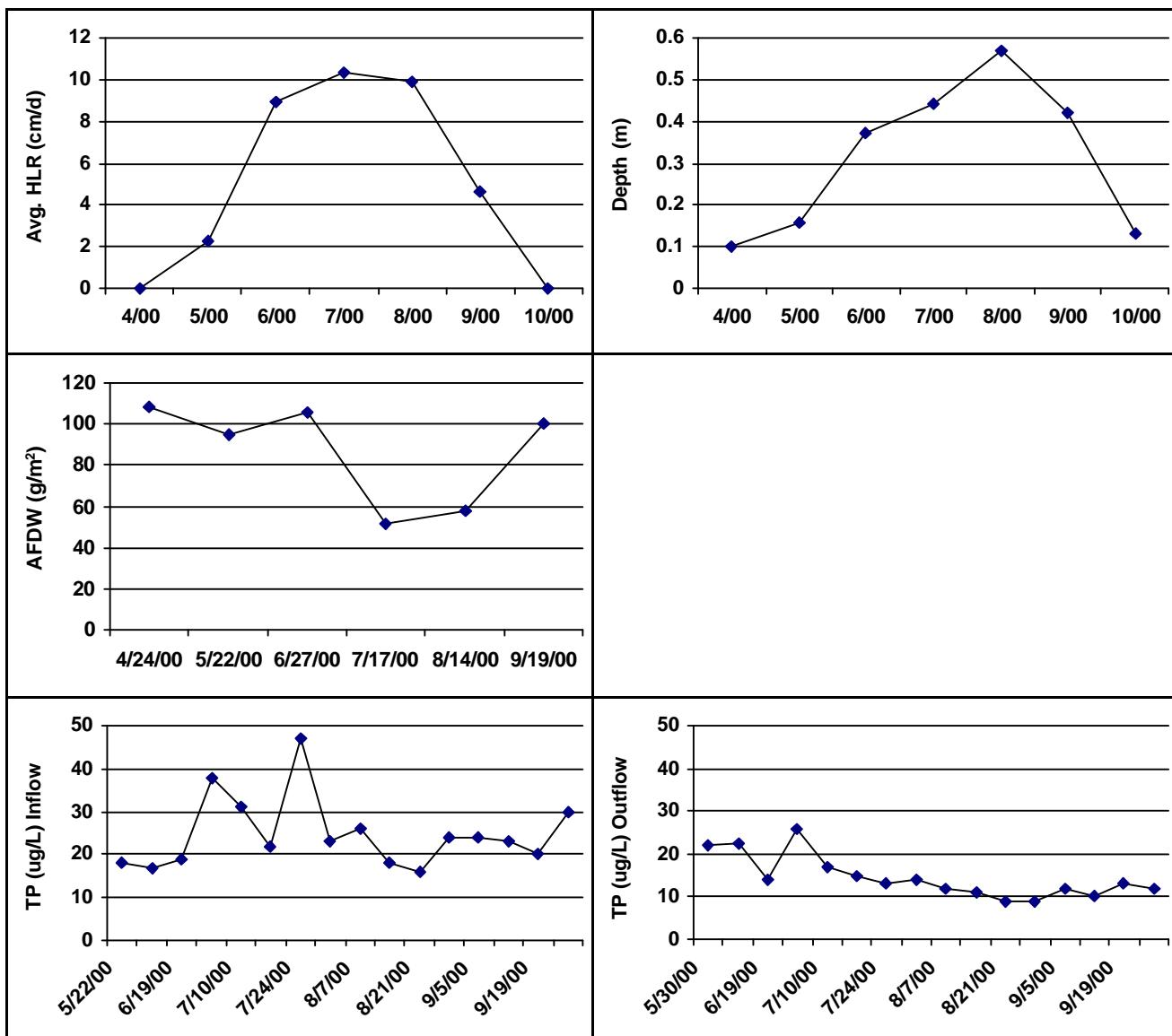
## Summary For Period

Tank/Cell	HLR (cm/d)	Depth (m)	TP in (ug/L)	TP out (ug/L)	k1 (m/y)
8	5.15	0.29	23	12	11.9
Mean	5.15	0.29	23	12	11.9

# PSTA Research and Demonstration Project

Treatment:	STC-6	Period:	4/1/2000	-	10/31/2000
Tank(s)/Cell(s):	3	Plants:	yes	Other:	
Research Scale:	Test Cell	Recirculation:	no		
Mesocosm Size:	28 x 80 m (2240m <sup>2</sup> )	Soil:	shellrock		

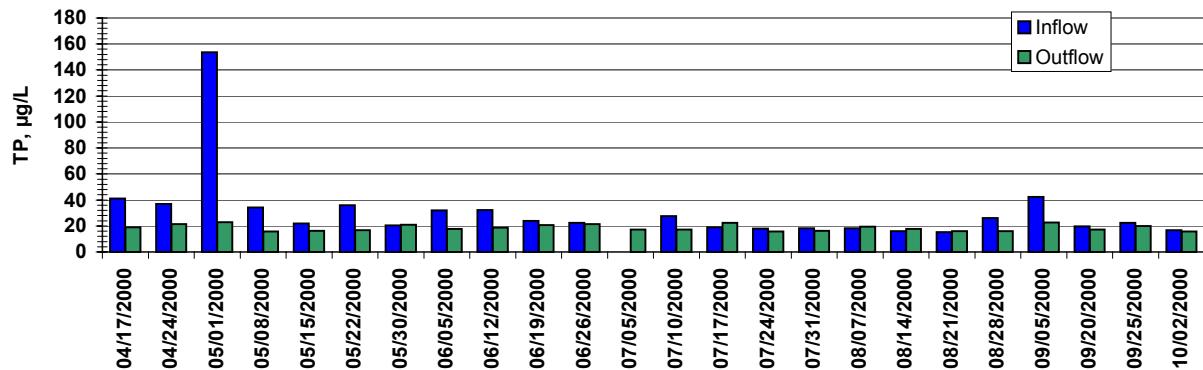
3



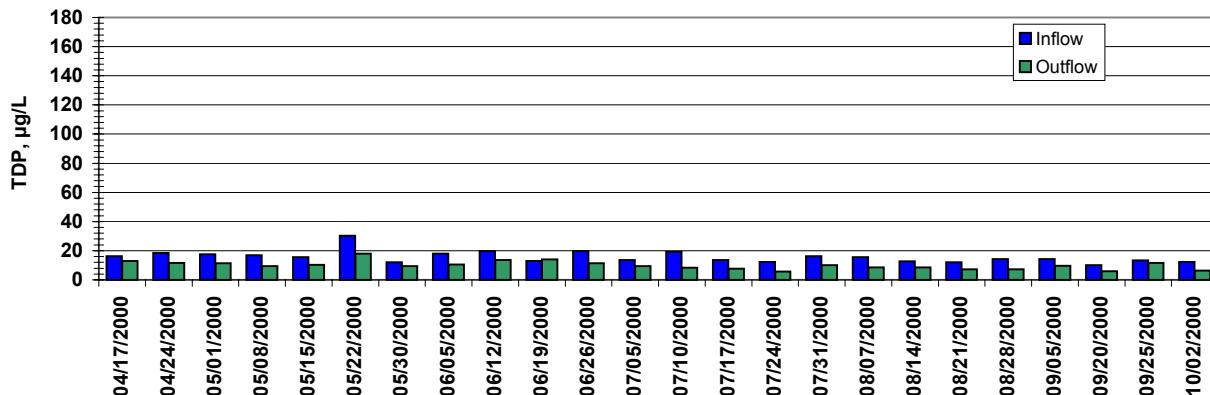
## Summary For Period

Tank/Cell	HLR (cm/d)	Depth (m)	TP in (ug/L)	TP out (ug/L)	k1 (m/y)
3	5.09	0.32	25	14	9.9
Mean	5.09	0.32	25	14	9.9

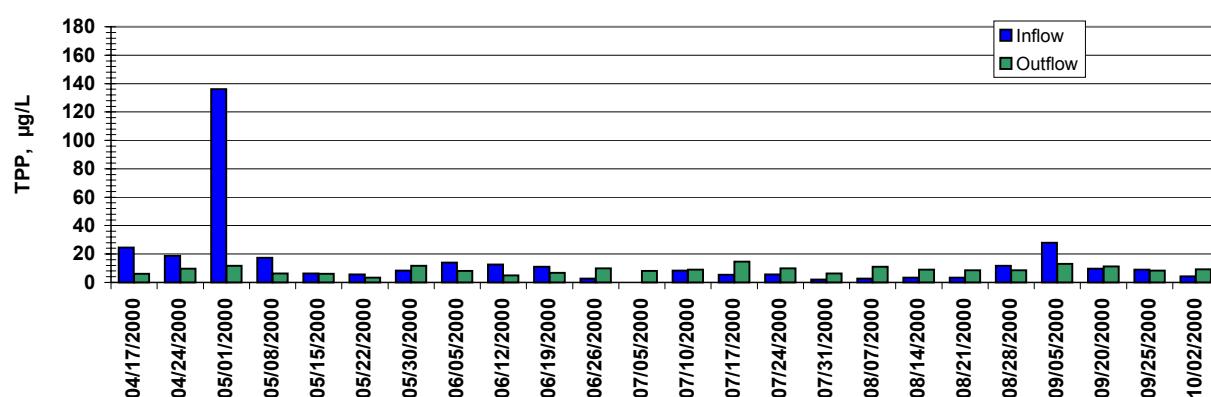
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

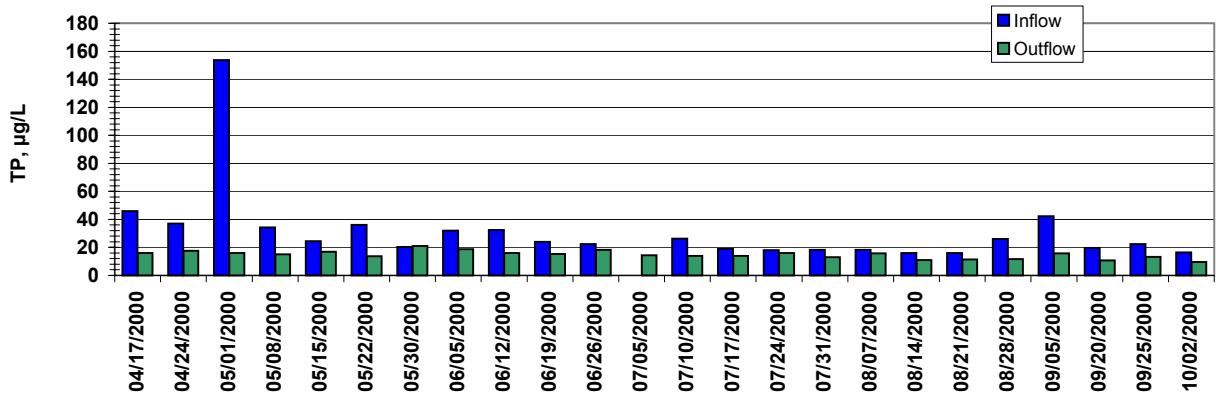


#### Exhibit E-1

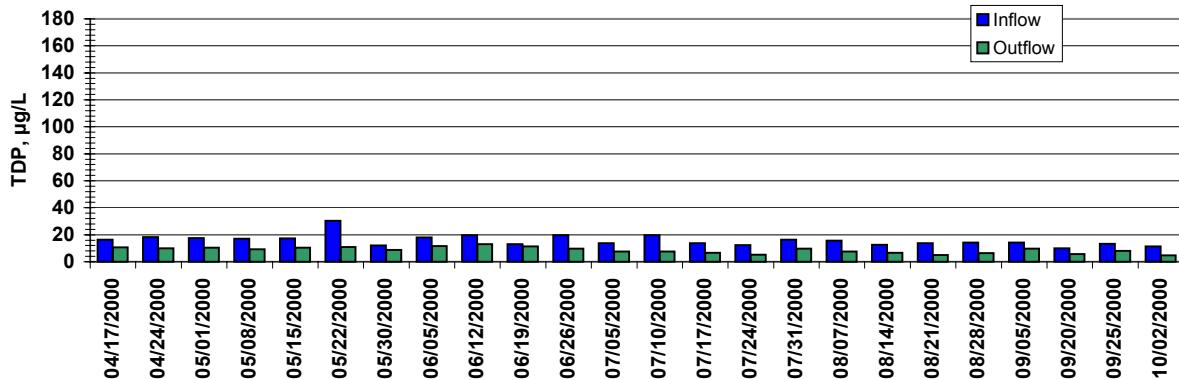
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 3, April 2000 - Oct 2000.

Key Conditions:	
Substrate:	Peat
Depth:	30 cm
HLR:	6 cm/day
Other:	

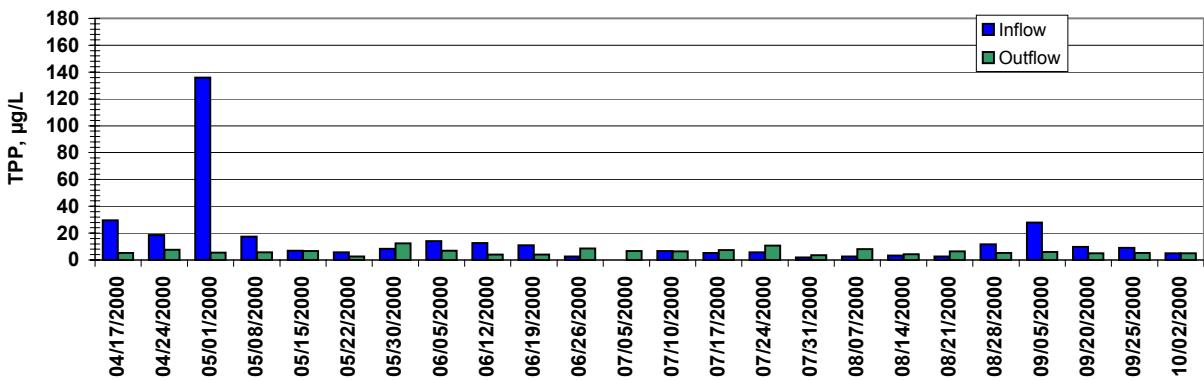
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

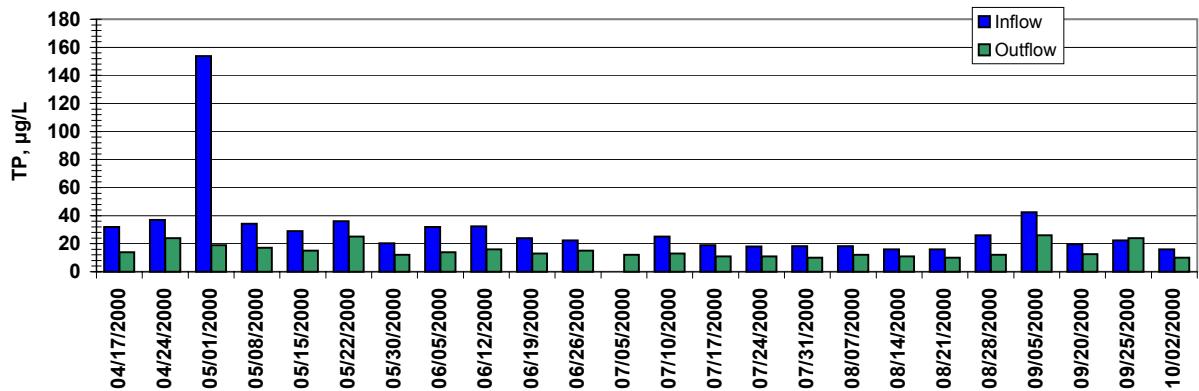


### Exhibit E-2

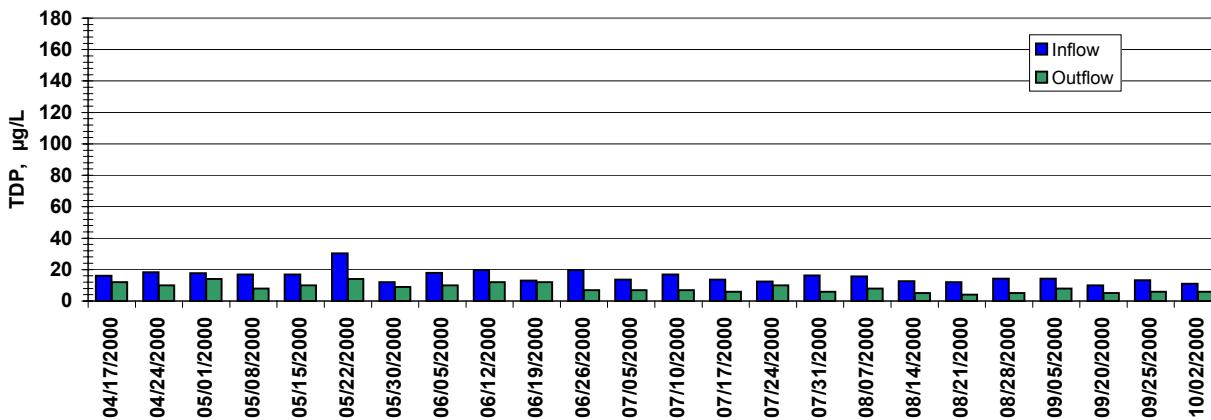
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 4, April 2000 - Oct 2000.

Key Conditions:	
Substrate:	Shellrock
Depth:	30 cm
HLR:	6 cm/day
Other:	

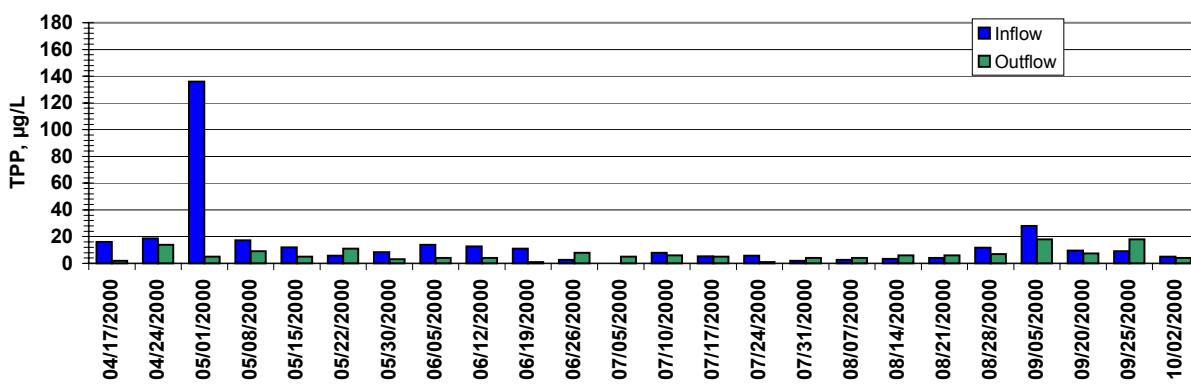
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

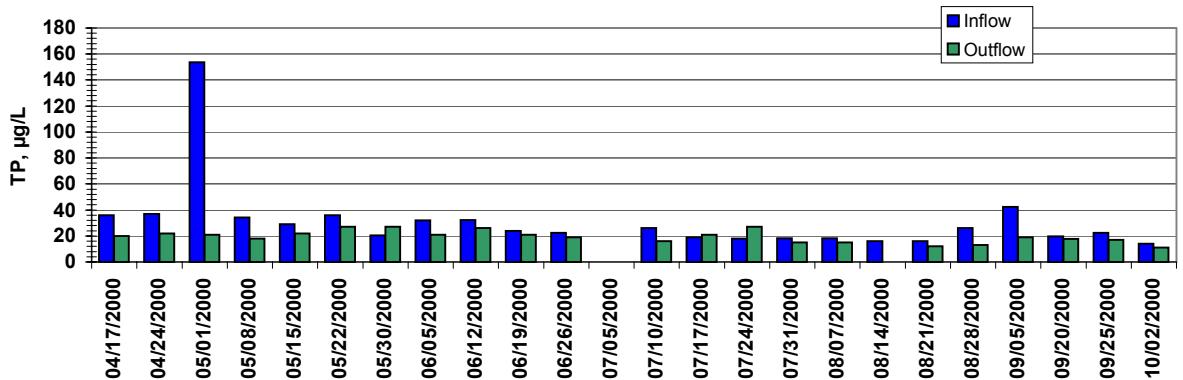


### Exhibit E-3

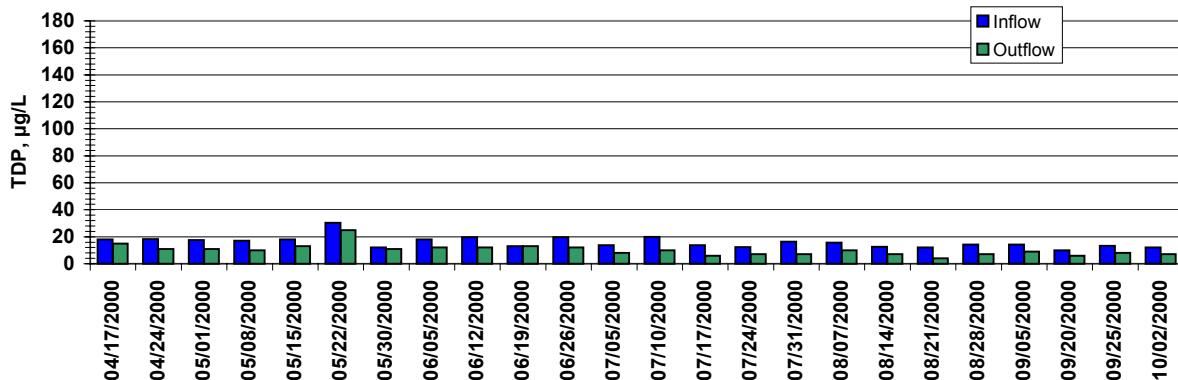
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 13, April 2000 - Sept 2000.

**Key Conditions:**  
 Substrate: Peat - Ca  
 Depth: 30 cm  
 HLR: 6 cm/day  
 Other:

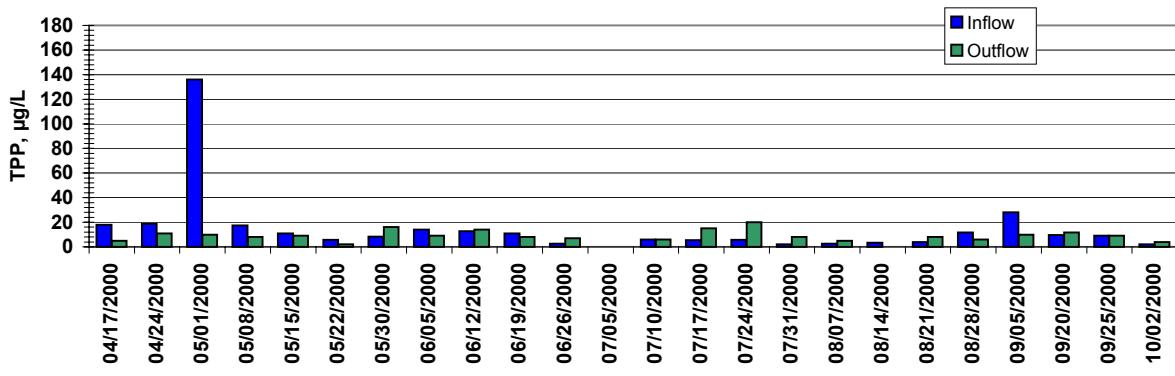
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

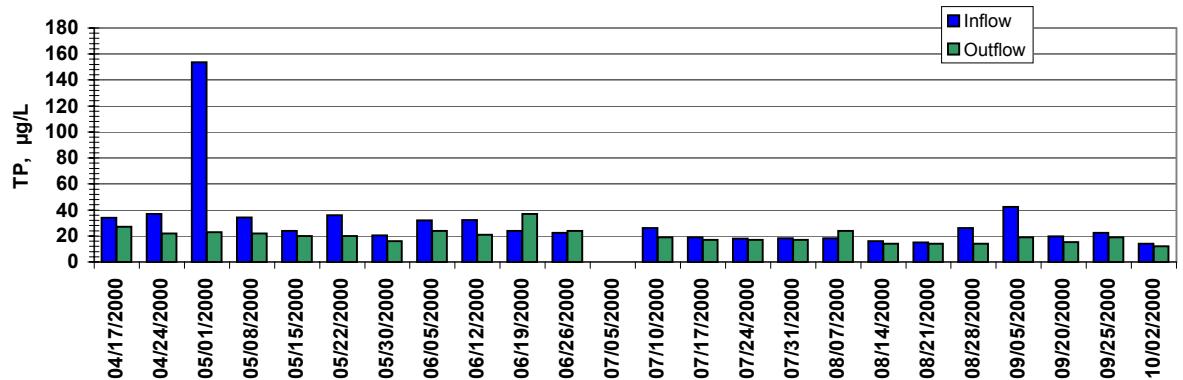


#### Exhibit E-4

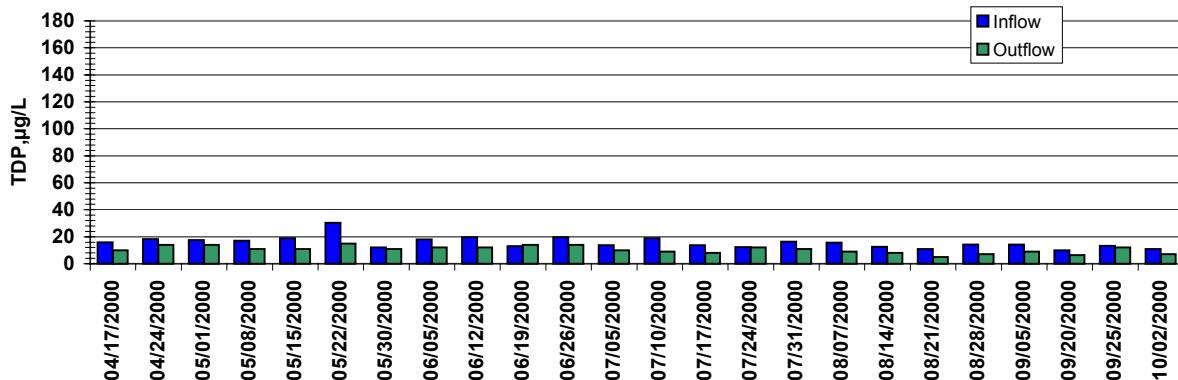
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 11, April 2000 - Oct 2000.

Key Conditions:	
Substrate:	Shellrock
Depth:	30 cm
HLR:	6 cm/day
Other:	

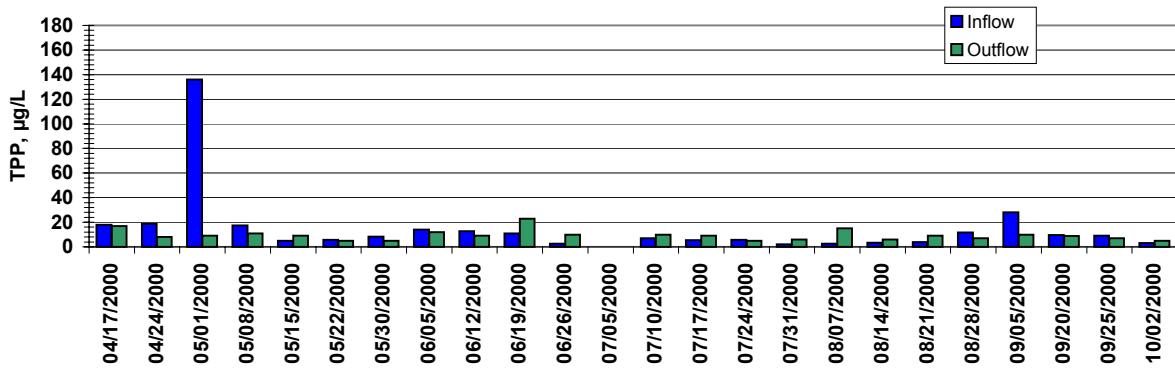
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

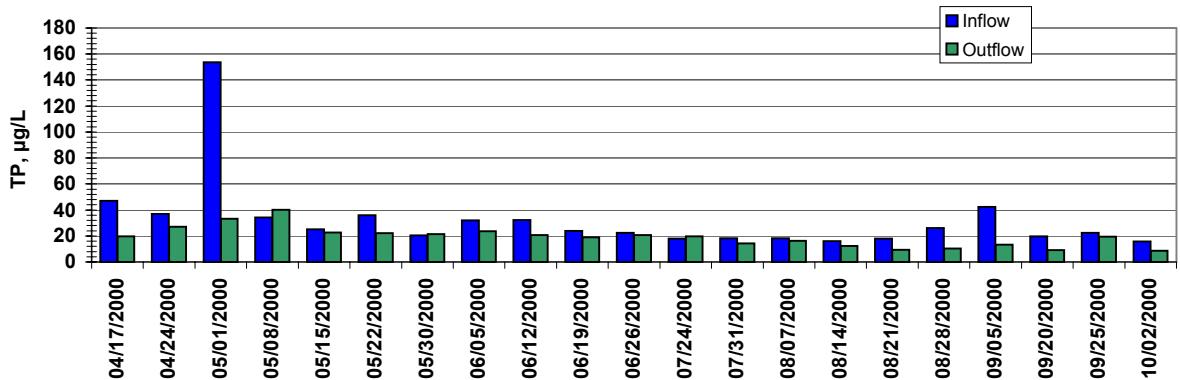


#### Exhibit E-5

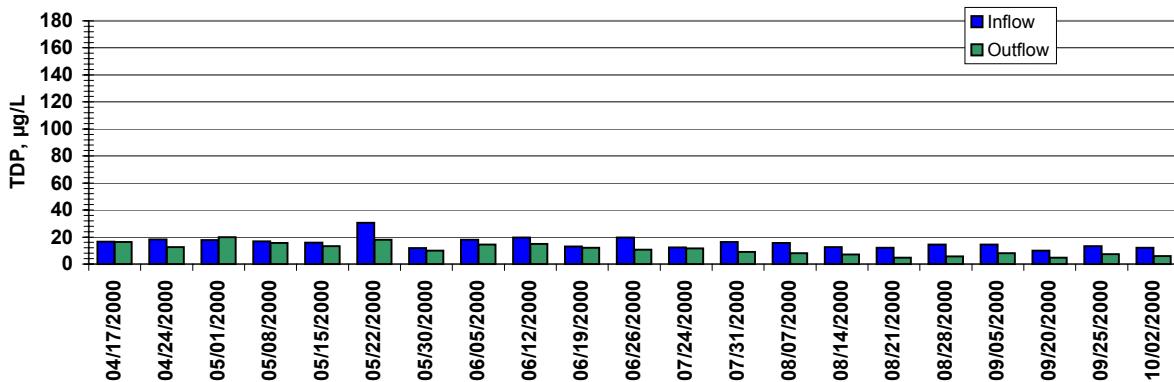
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 12, April 2000 - Oct 2000.

Key Conditions:	
Substrate:	Peat
Depth:	30 cm
HLR:	6 cm/day
Other:	

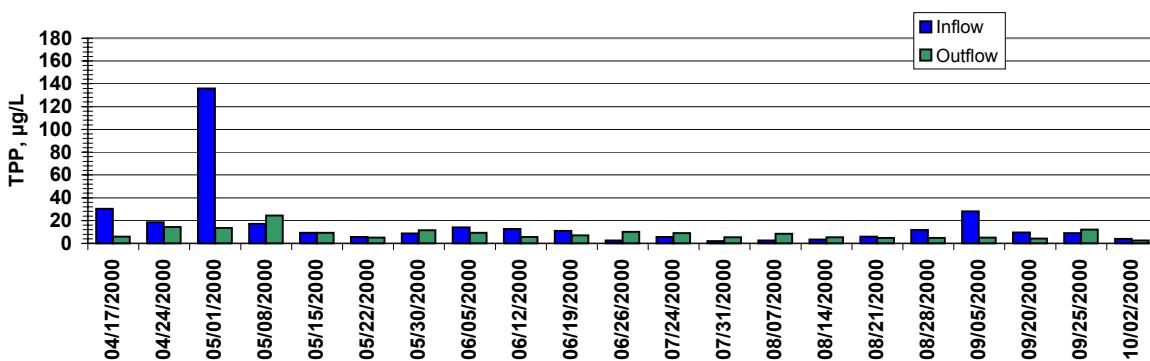
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

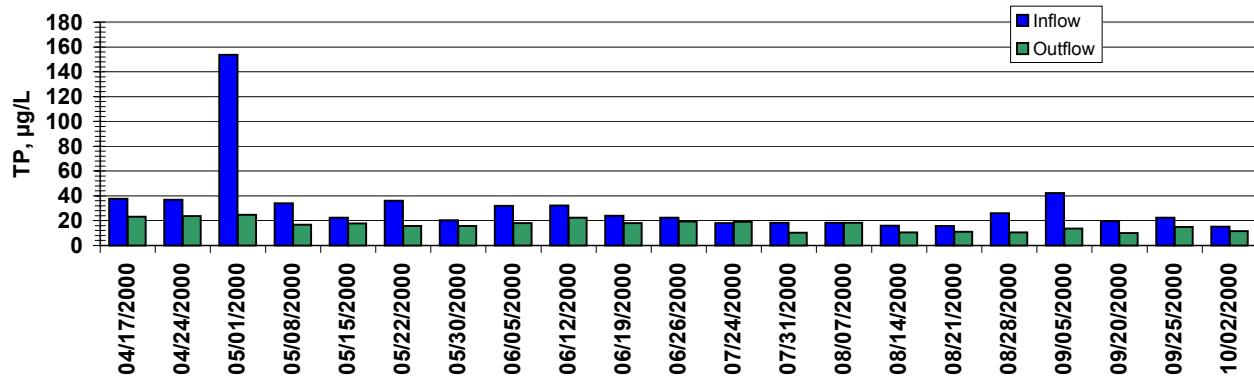


#### Exhibit E-6

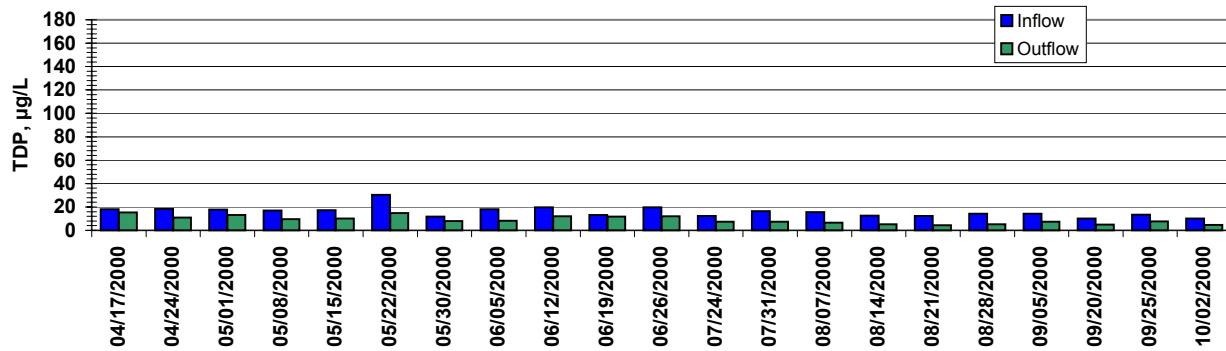
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 13, April 2000 - Oct 2000.

Key Conditions:	
Substrate:	Peat - Ca
Depth:	30 cm
HLR:	6 cm/day
Other:	

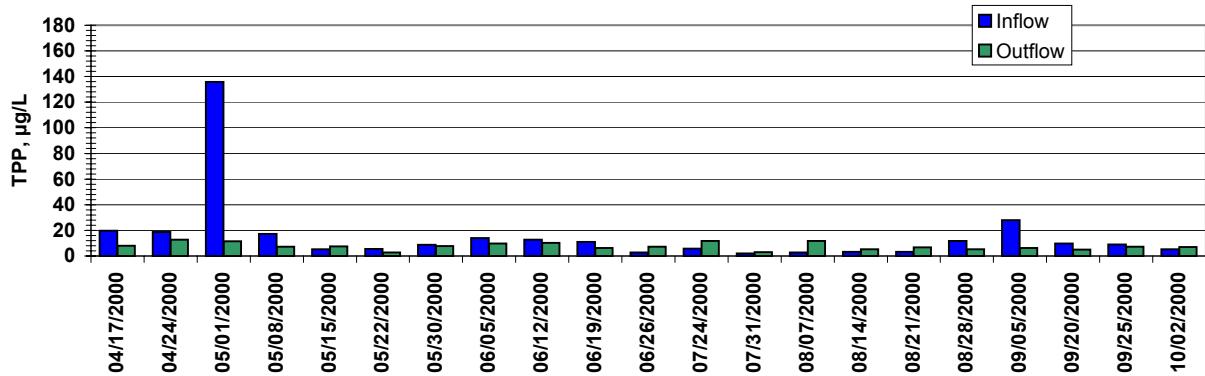
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

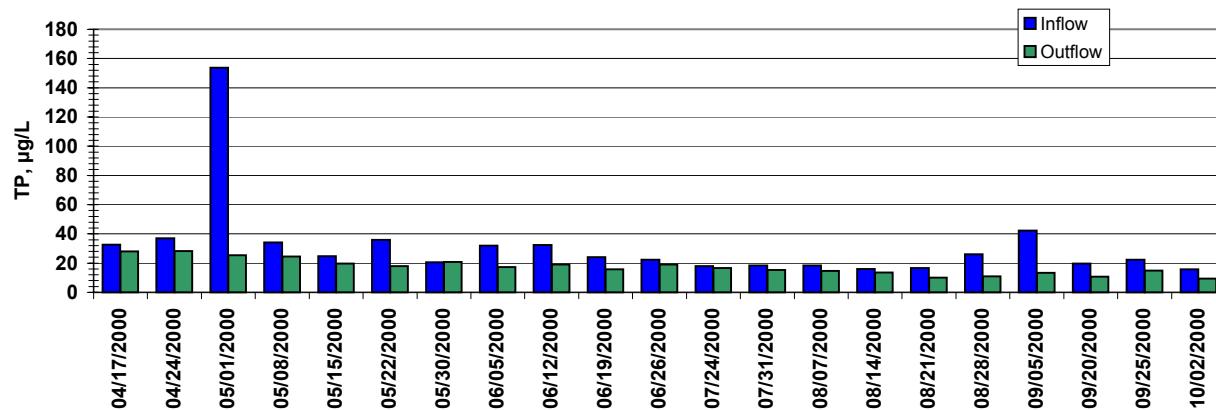


### Exhibit E-7

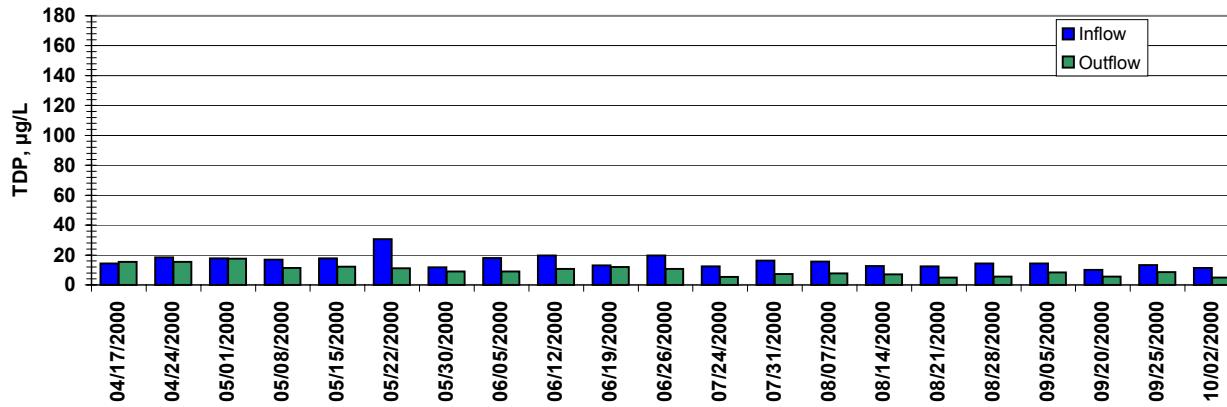
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 14, April 2000 - Oct 2000.

**Key Conditions:**  
 Substrate: Limerock  
 Depth: 30 cm  
 HLR: 6 cm/day  
 Other:

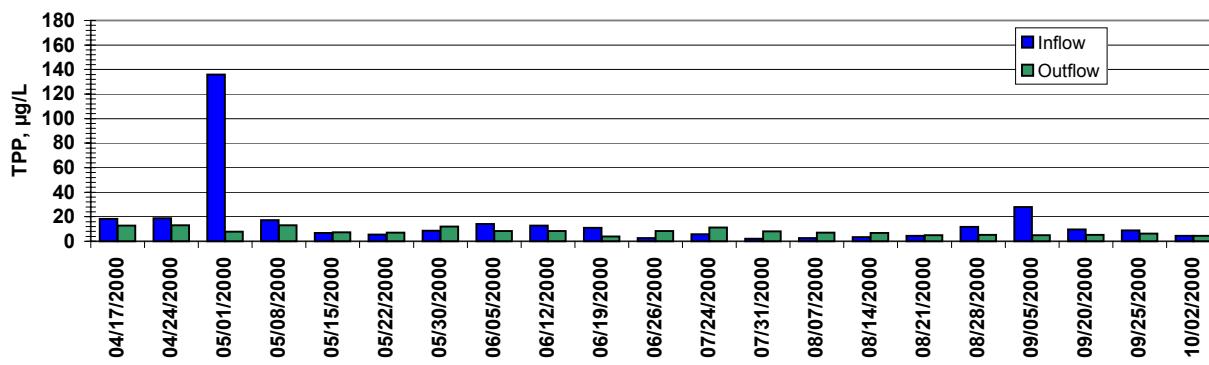
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

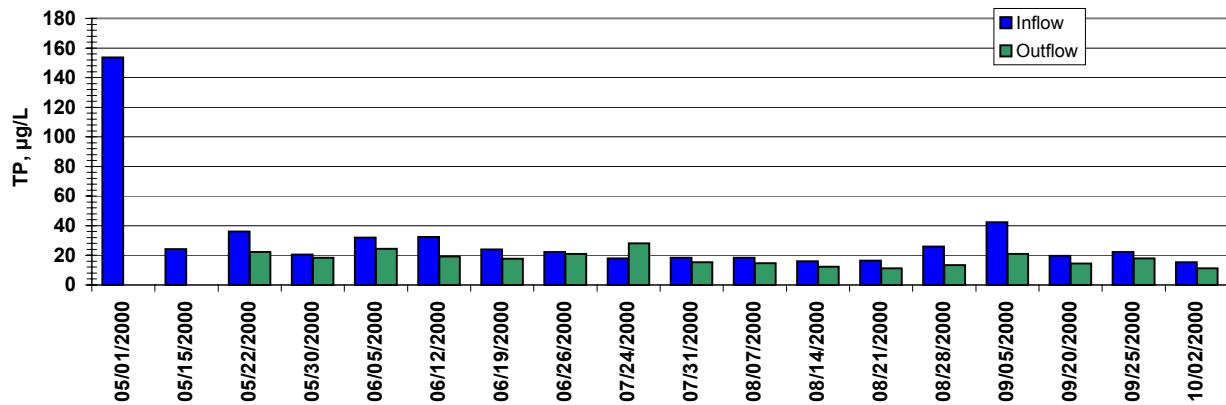


#### Exhibit E-8

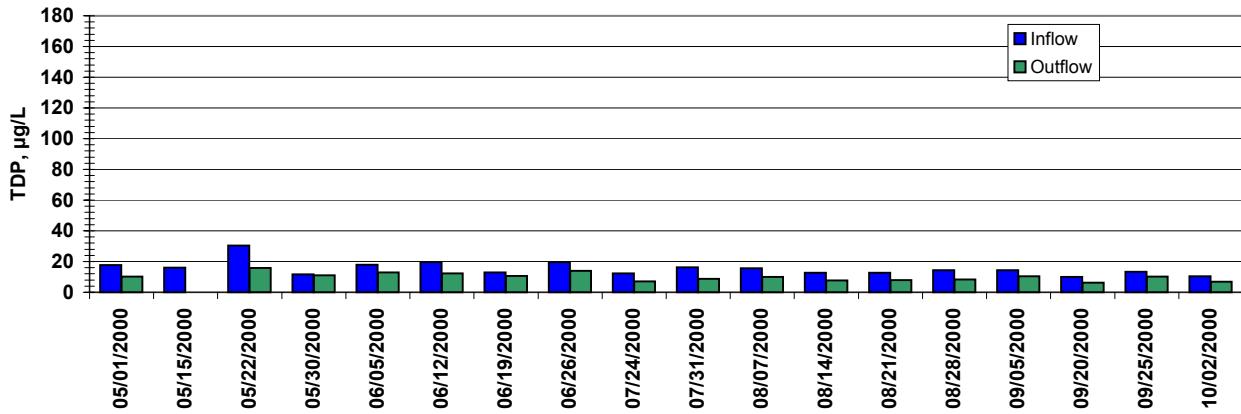
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 15, April 2000 - Oct 2000.

Key Conditions:	
Substrate:	Shellrock
Depth:	30 cm
HLR:	Recirc
Other:	

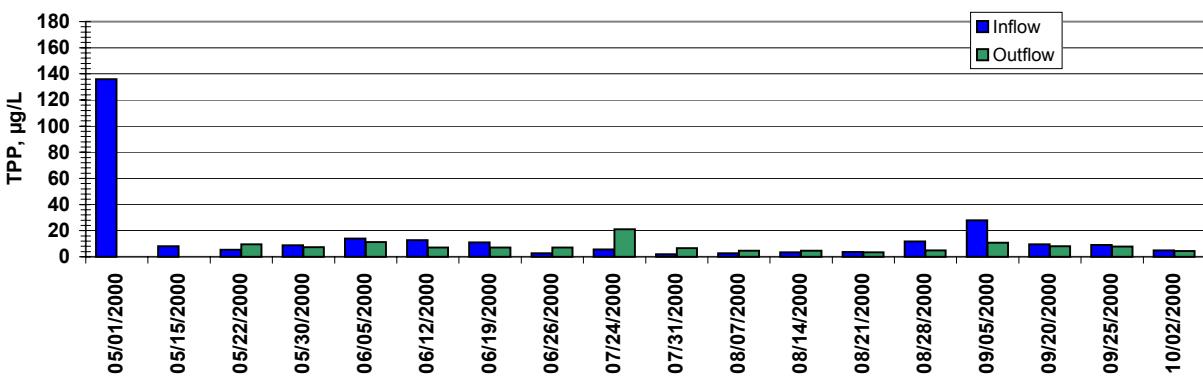
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS



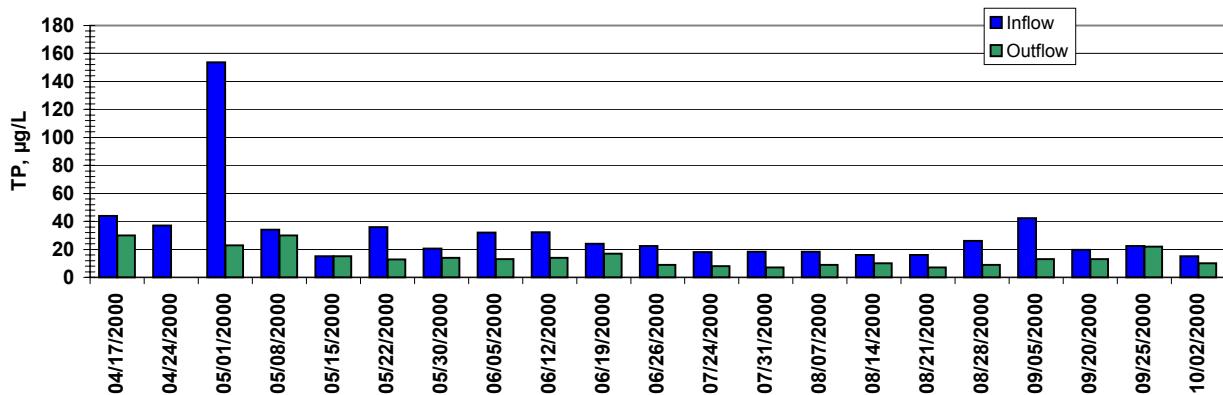
Note: Treatment in dry down from 3/16/2000- 5/15/2000; no water samples taken during this time.

#### Exhibit E-9

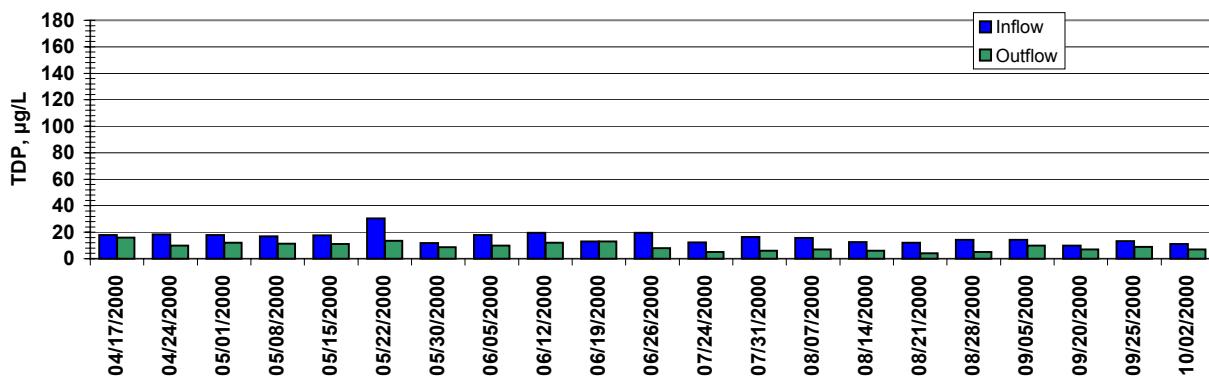
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 16, May 2000 - Sept 2000.

Key Conditions:	
Substrate:	Shellrock
Depth:	0 - 30 cm
HLR:	Seasonal
Other:	

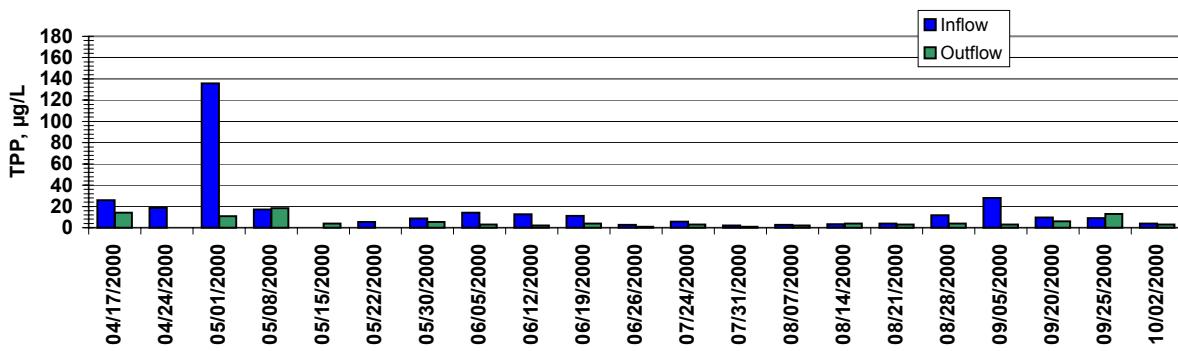
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

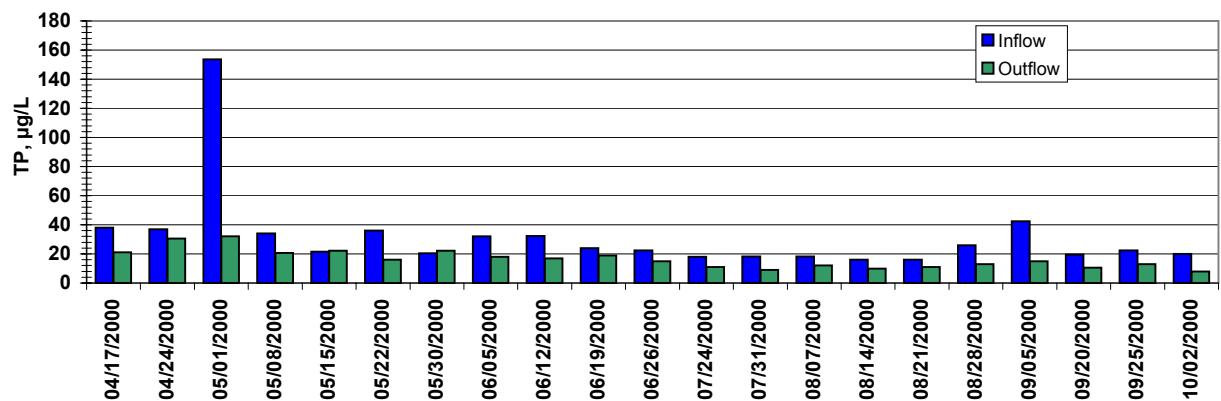


#### Exhibit E-10

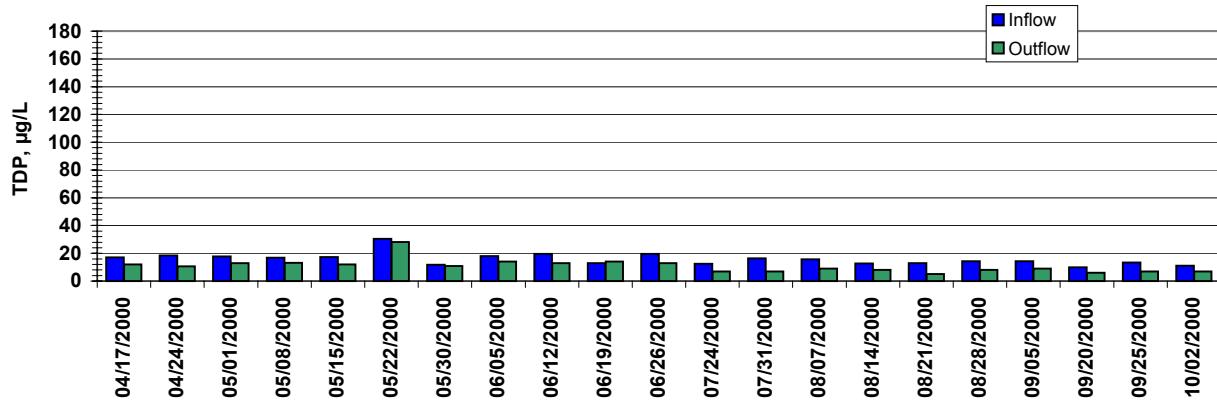
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 17, April 2000 - Oct 2000.

Key Conditions:	
Substrate:	Sand - HCl
Depth:	30 cm
HLR:	6 cm/day
Other:	

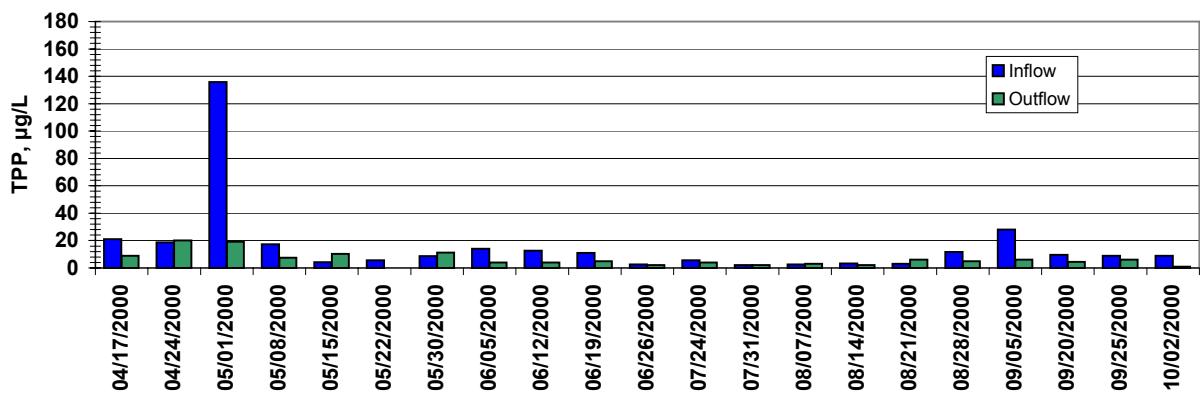
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS



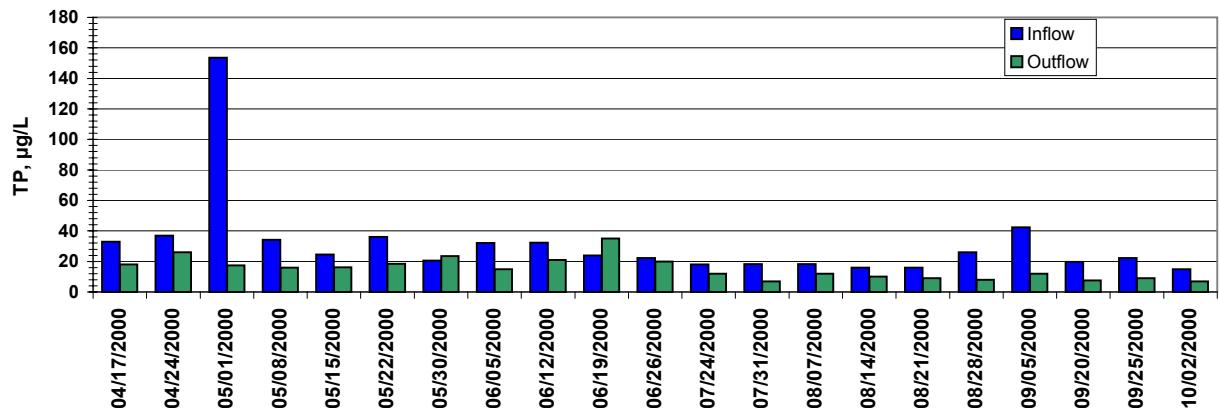
#### Exhibit E-11

Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 18, April 2000 - Oct 2000.

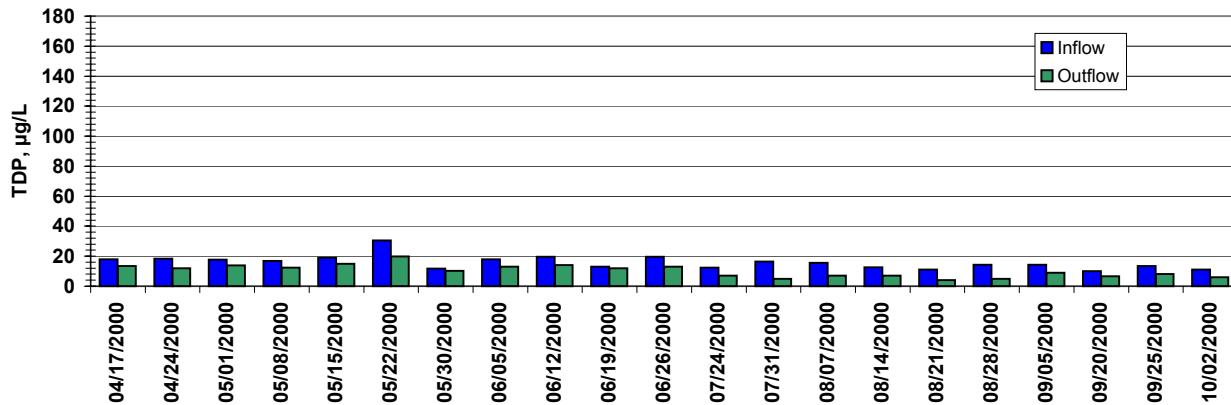
#### Key Conditions:

Substrate: None  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

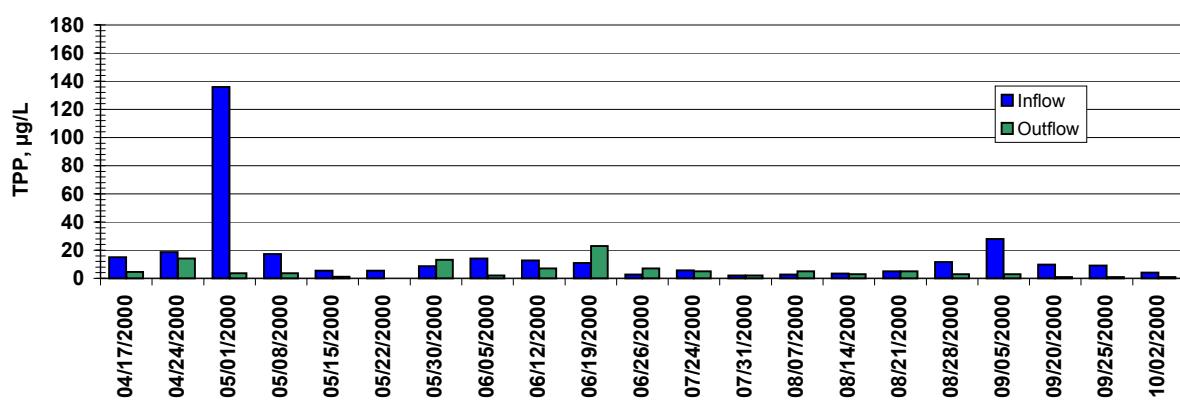
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS

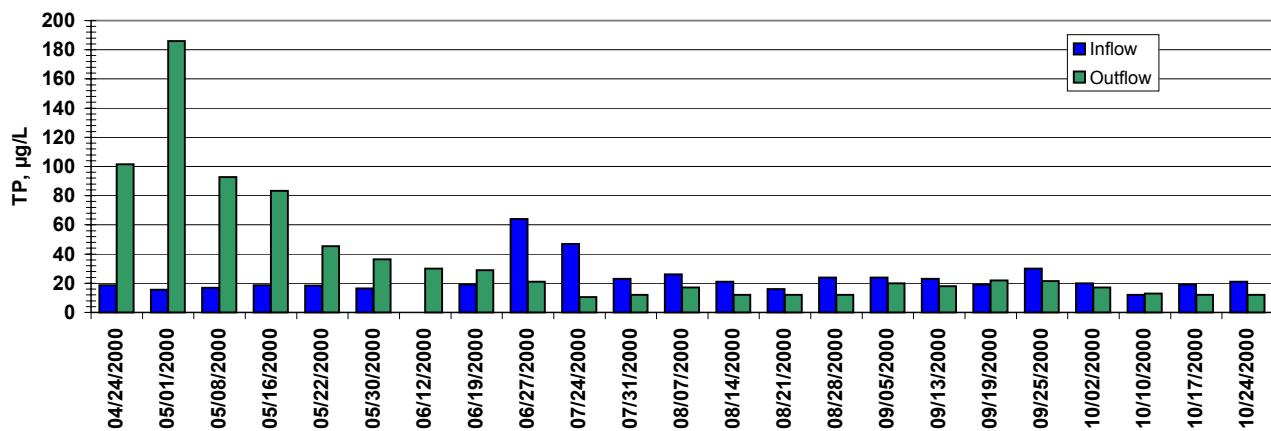


#### Exhibit E-12

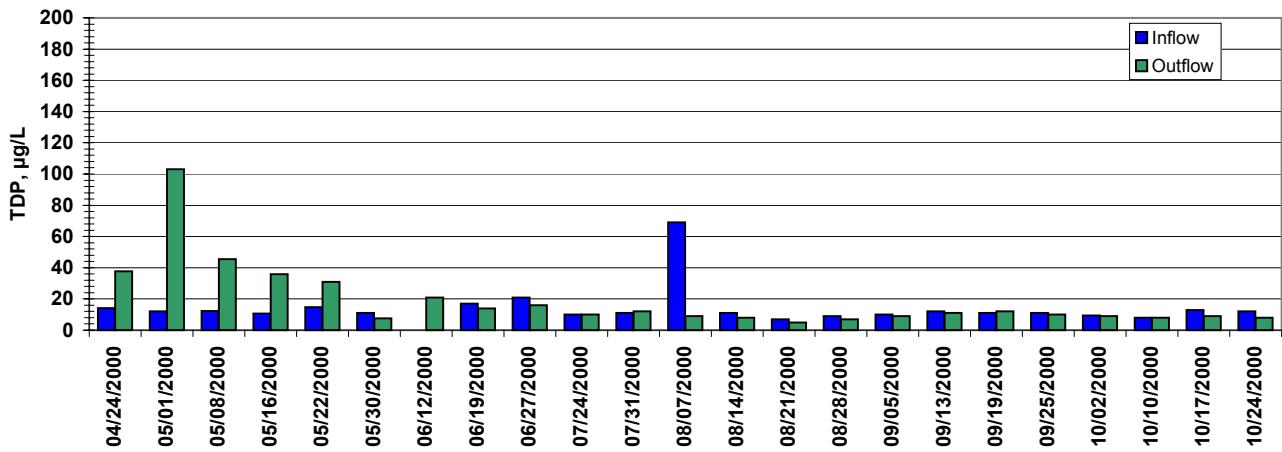
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for Porta-PSTA Treatment No. 19, April 2000 - Oct 2000.

Key Conditions:	
Substrate:	Synthetic
Depth:	30 cm
HLR:	6 cm/day
Other:	

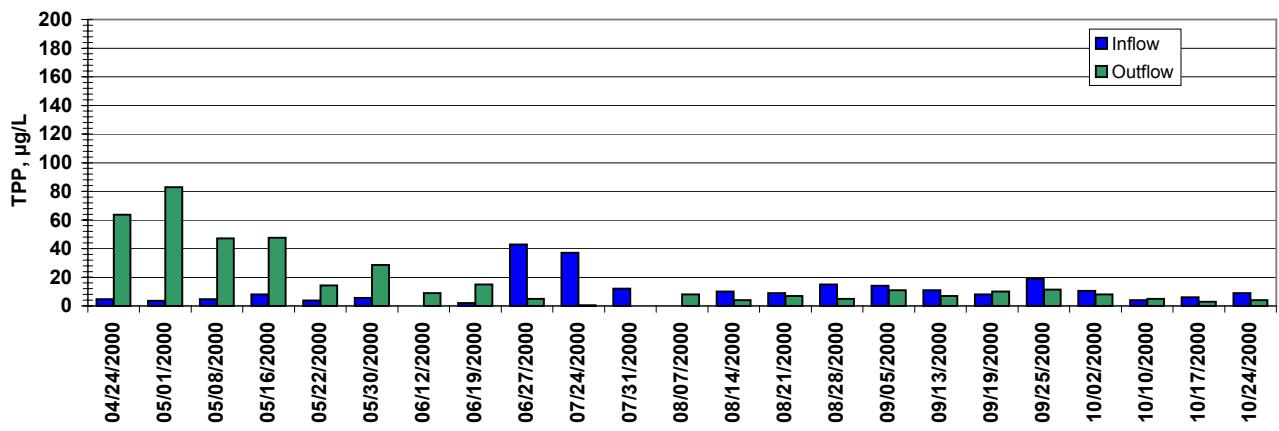
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS



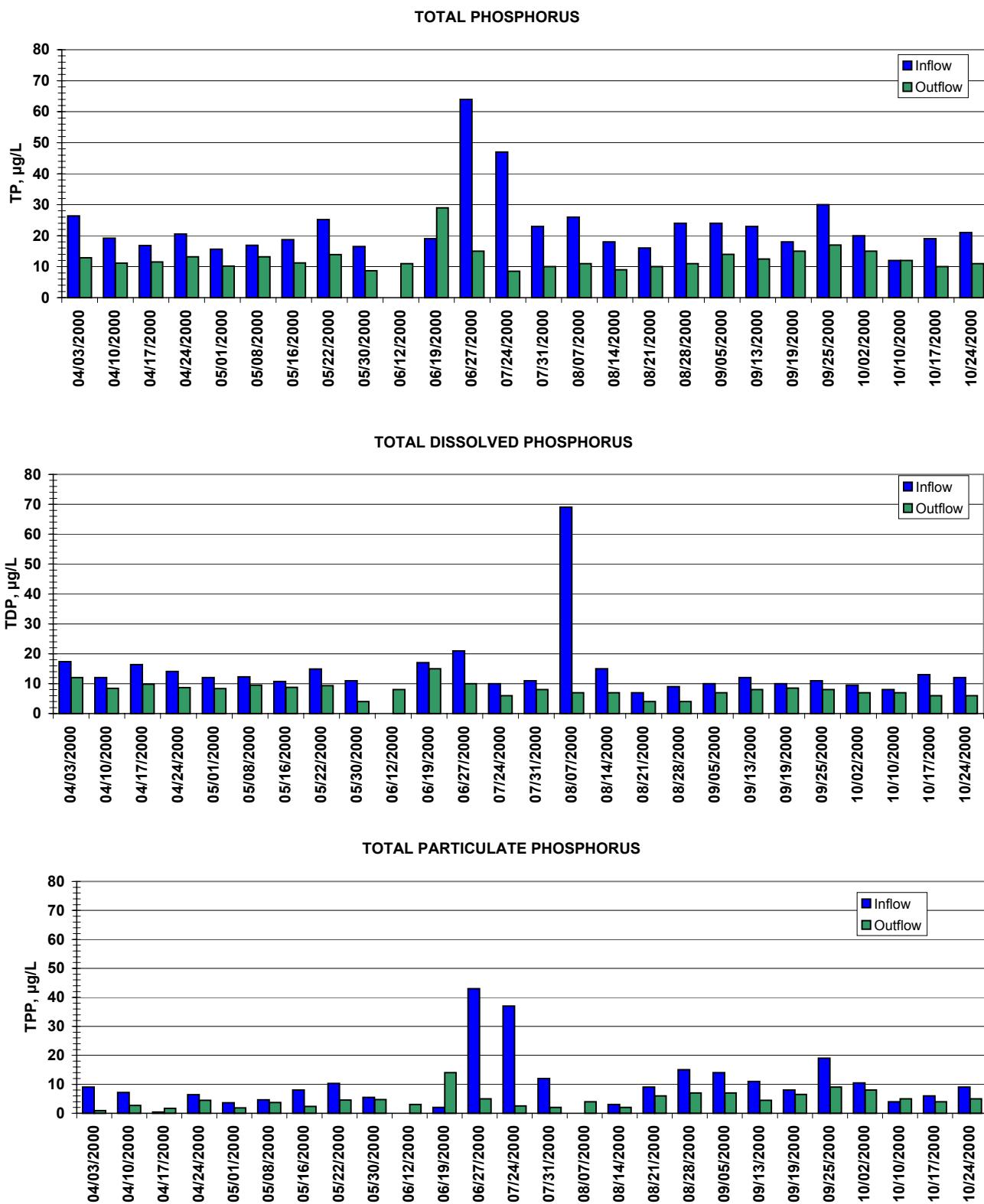
Note: Inflow TP and TDP data are collected by the District; missing data points are either not available or pending.

#### Exhibit E-13

Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for South Test Cell Treatment No. 4, April 2000 - October 2000

#### Key Conditions:

Substrate: Peat - Ca  
Depth: 30 cm  
HLR: 6 cm/day



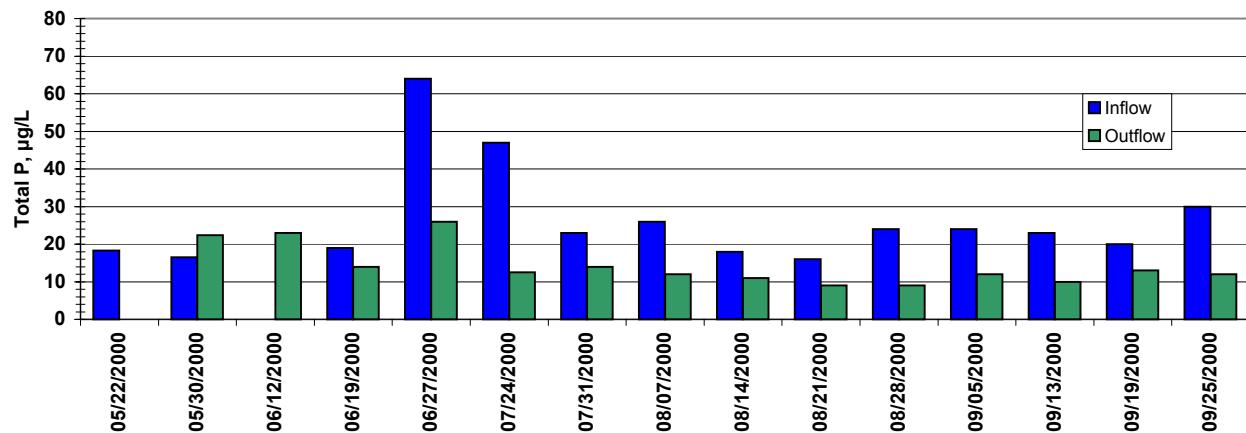
Note: Inflow TP and TDP data are collected by the District; missing data points are either not available or pending.

#### Exhibit E-14

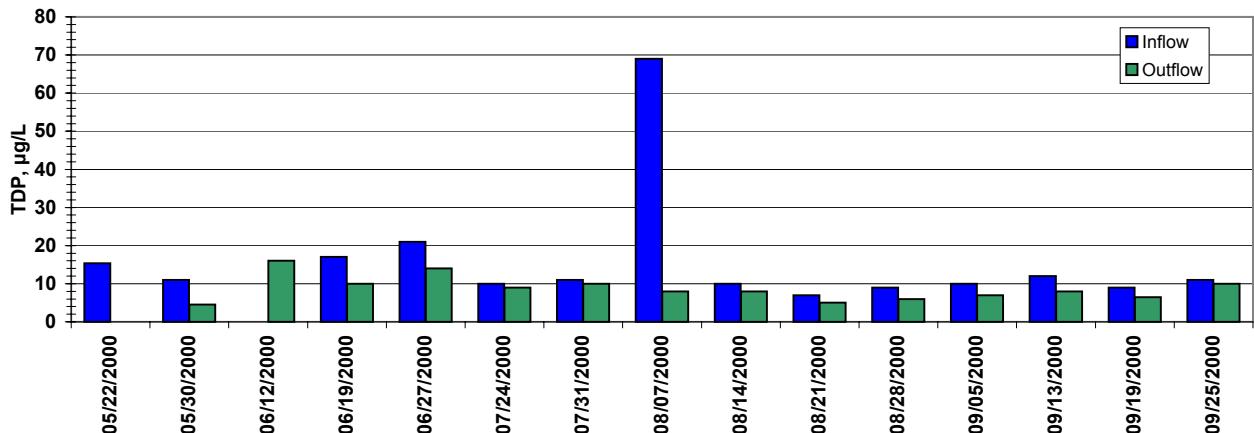
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for South Test Cell Treatment No. 5, April 2000 - October 2000

<b>Key Conditions:</b>		
Substrate:	Shellrock	
Depth:	30 cm	
HLR:	6 cm/day	

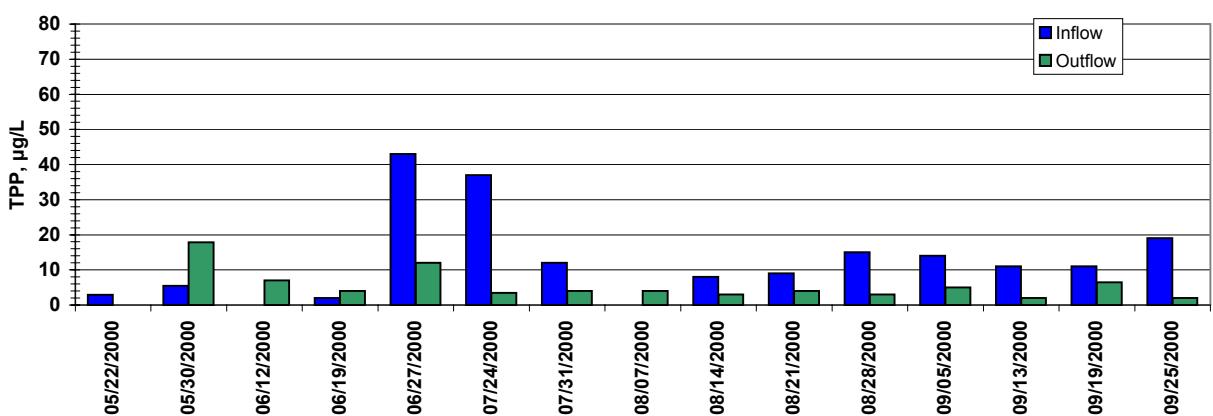
### TOTAL PHOSPHORUS



### TOTAL DISSOLVED PHOSPHORUS



### TOTAL PARTICULATE PHOSPHORUS



Notes: Inflow TP and TDP data are collected by the District; missing data points are either not available or pending.

Treatment in dry down mode; no outflow samples taken from 3/9/00- 5/30/00.

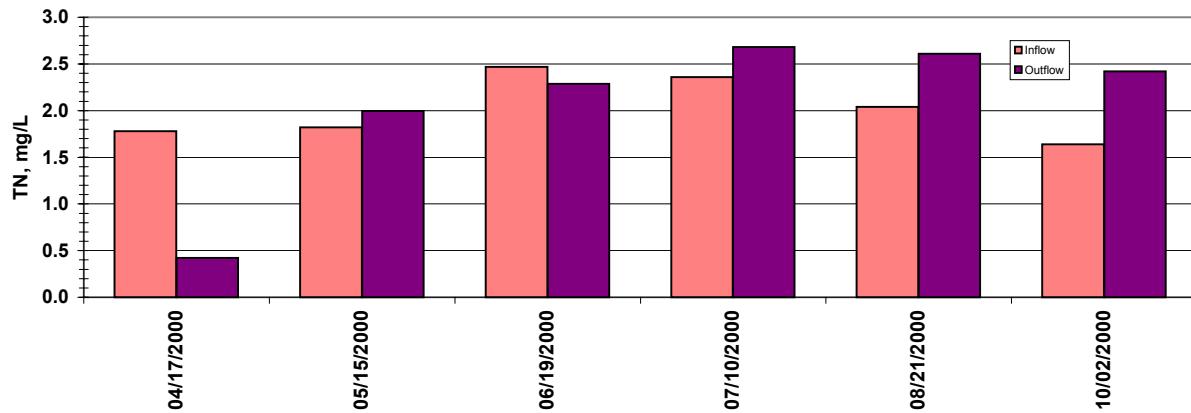
No inflow to treatment from October 2000 to December 2000 because of mechanical difficulties.

### Exhibit E-15

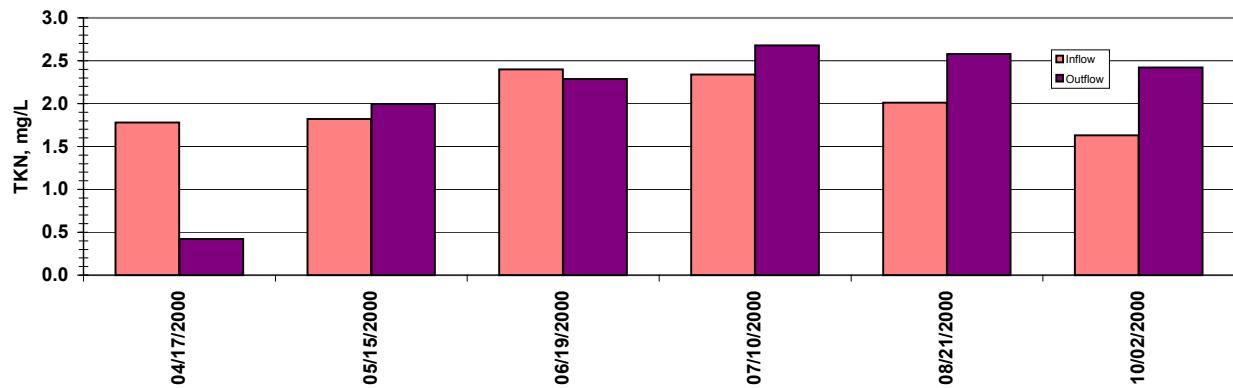
Inflow and Outflow Weekly Average Values for Total Phosphorus, Total Dissolved Phosphorus, and Total Particulate Phosphorus for South Test Cell Treatment No. 6, April 2000 - October 2000

Key Conditions:			
Substrate:	Shellrock		
Depth:	0 - 30 cm		
HLR:	Seasonal		

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



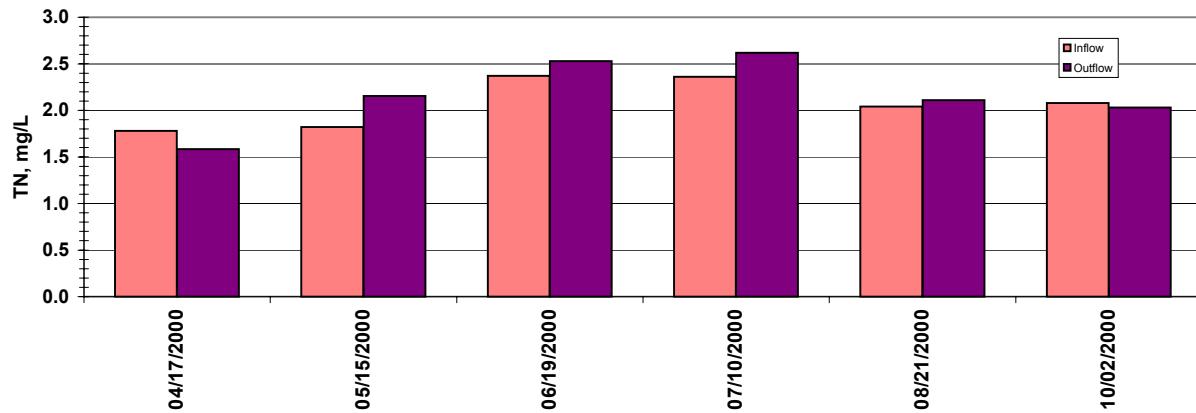
#### Exhibit E-16

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No. 3, April 2000 - October 2000.

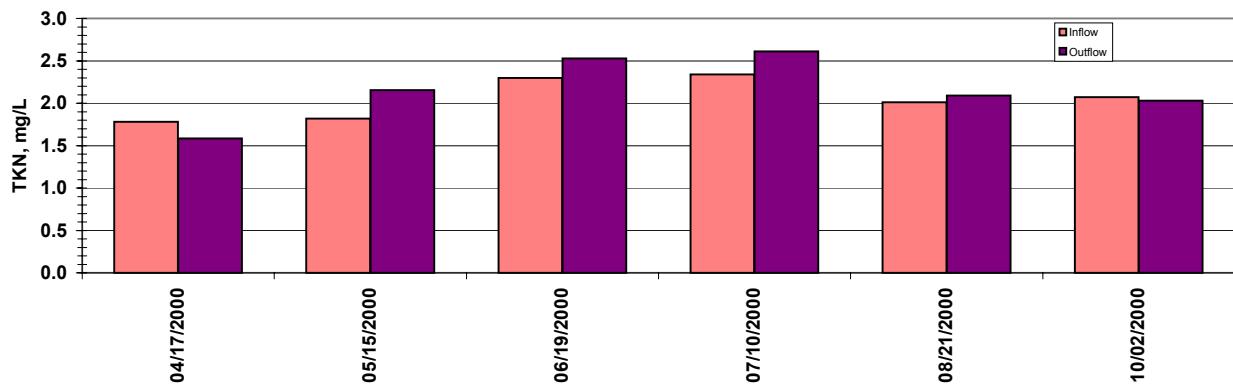
#### Key Conditions:

Substrate: Peat  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



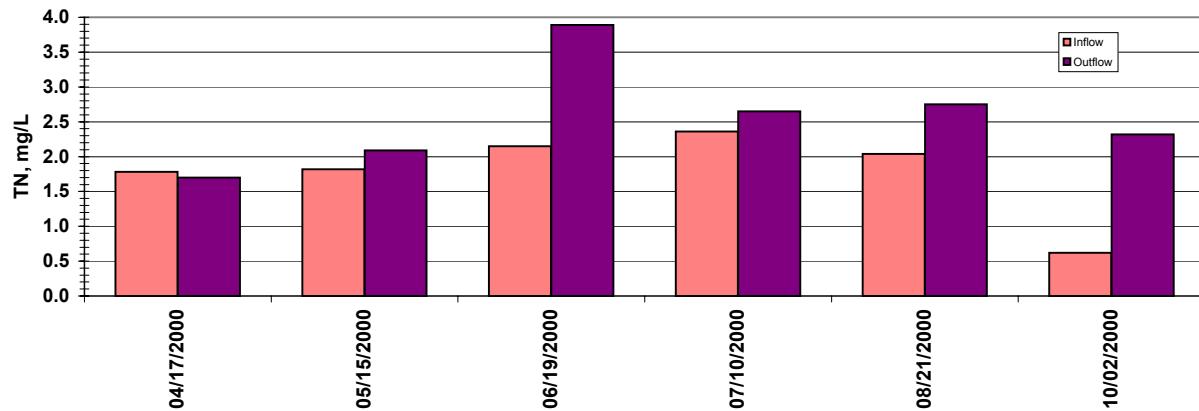
#### Exhibit E-17

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No.4, April 2000 - October 2000.

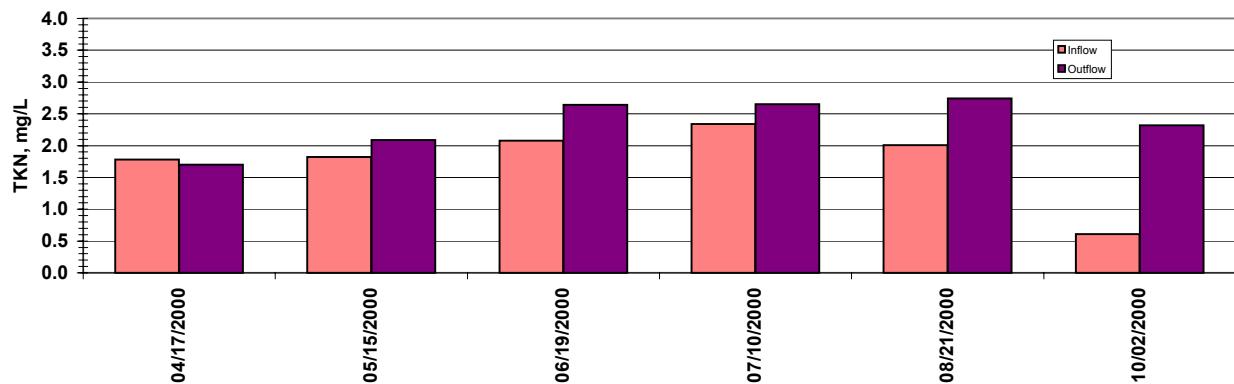
#### Key Conditions:

Substrate: Shellrock  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



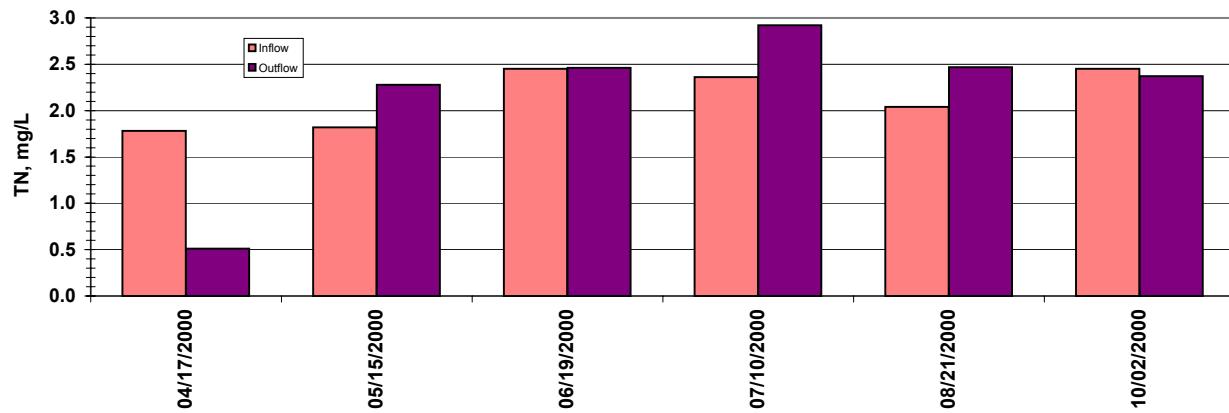
#### Exhibit E-18

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No.7, April 2000 - October 2000.

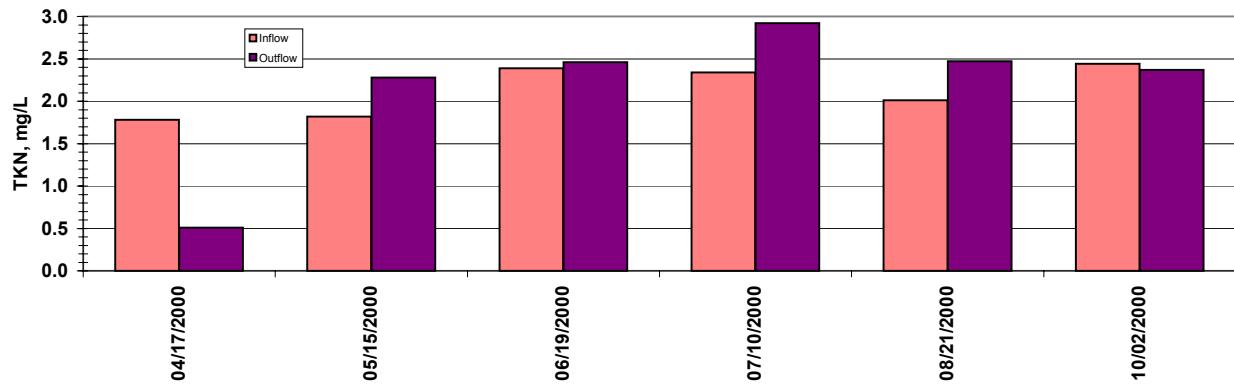
#### Key Conditions:

Substrate: Peat - Ca  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



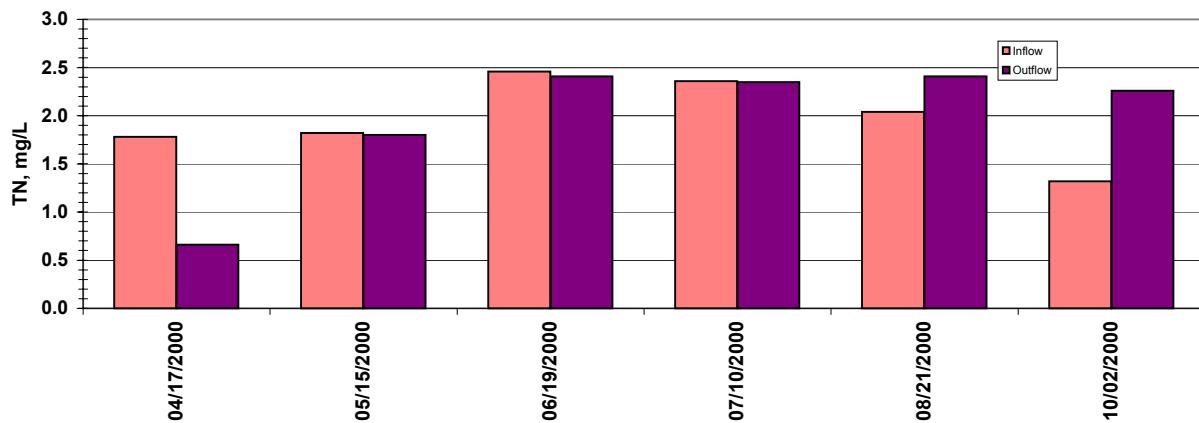
#### Exhibit E-19

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No11, April 2000 - October 2000.

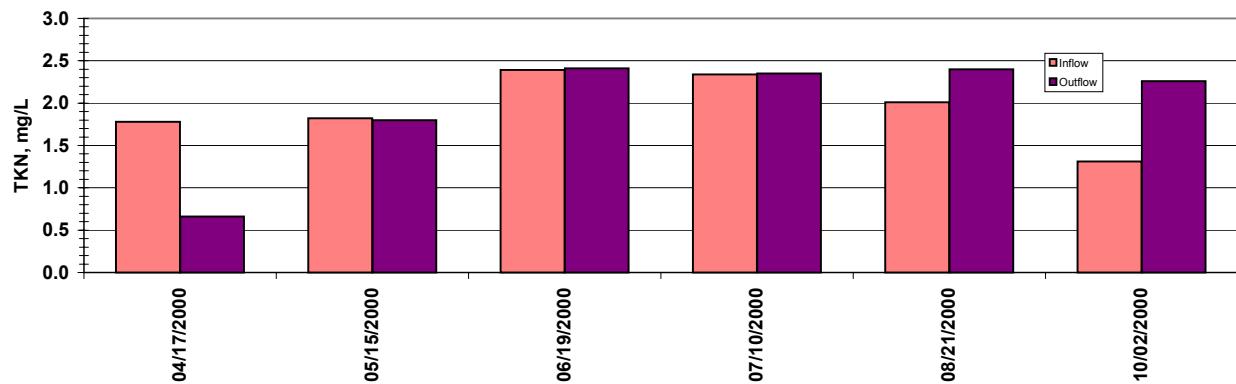
#### Key Conditions:

Substrate: Shellrock  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



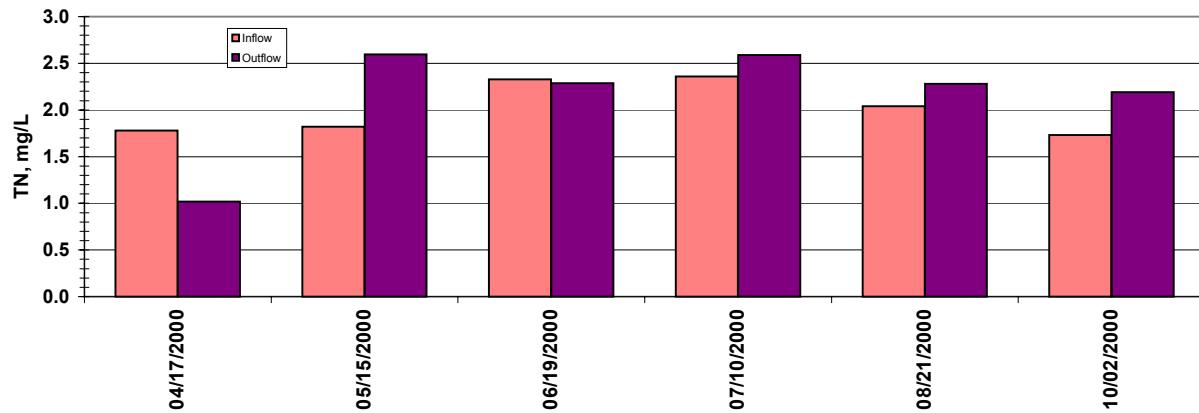
#### Exhibit E-20

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No 12, April 2000 - October 2000.

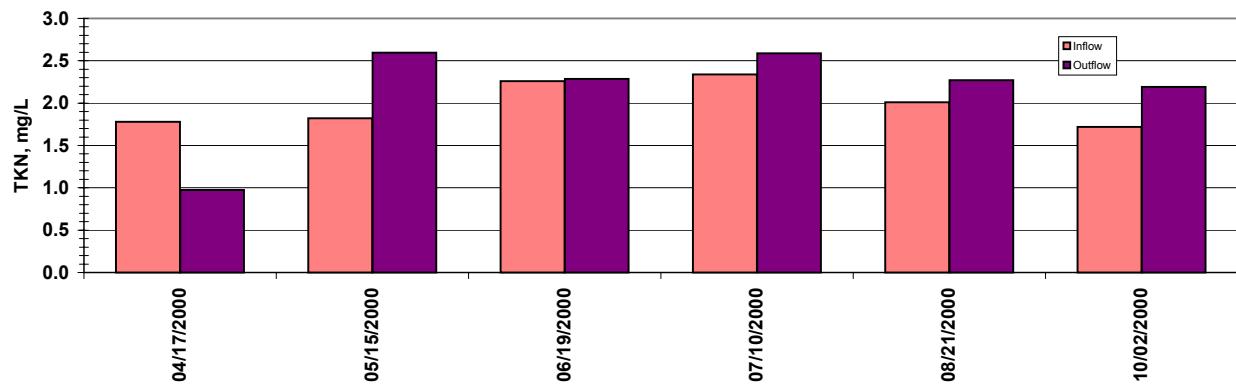
#### Key Conditions:

Substrate: Peat  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



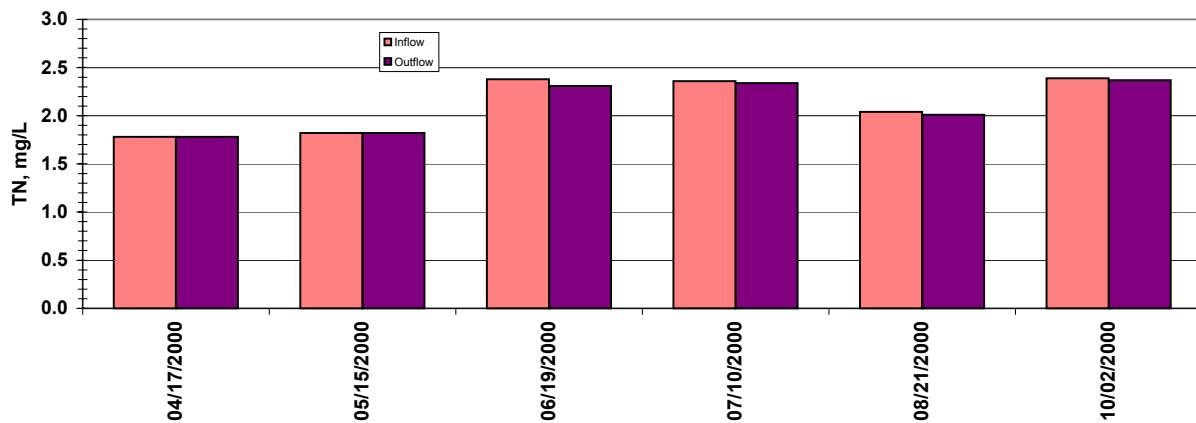
#### Exhibit E-21

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No. 13, April 2000 - October 2000.

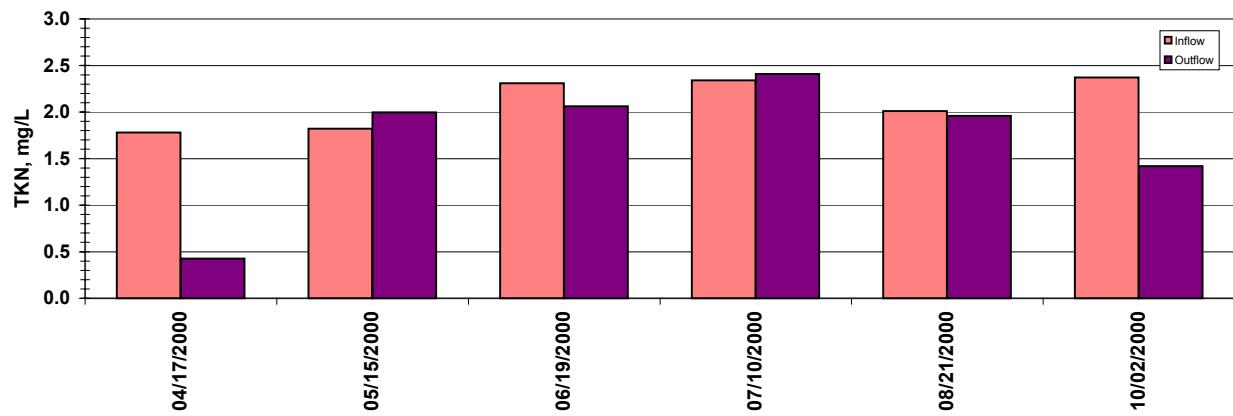
#### Key Conditions:

Substrate: Peat - Ca  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN

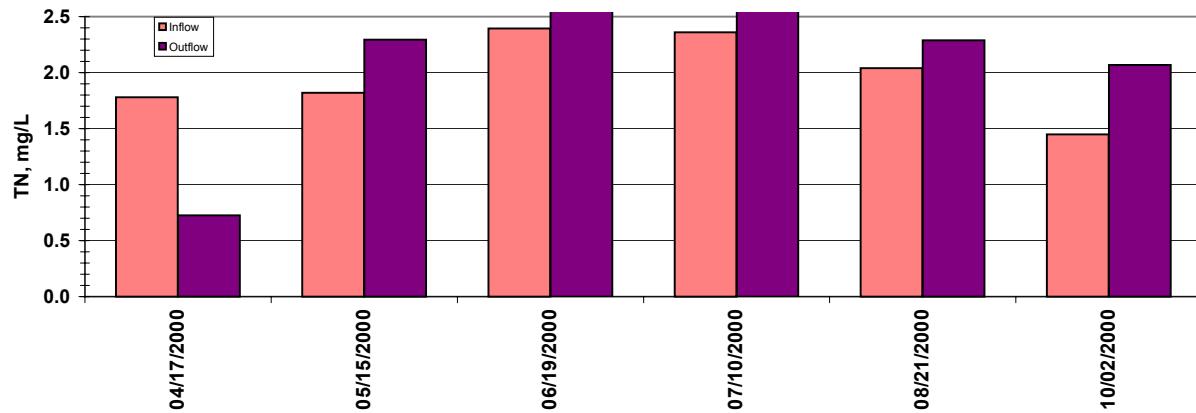


#### Exhibit E-22

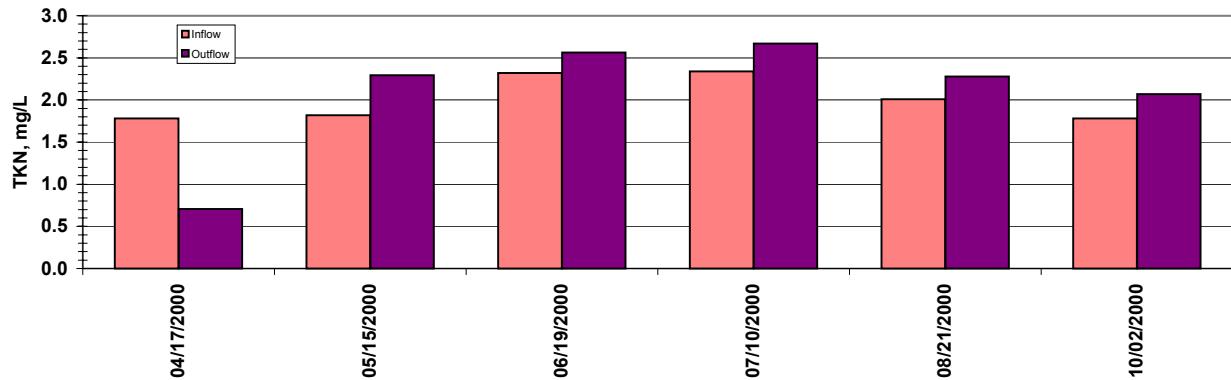
Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No. 14, April 2000 - October 2000.

**Key Conditions:**  
Substrate: Limerock  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



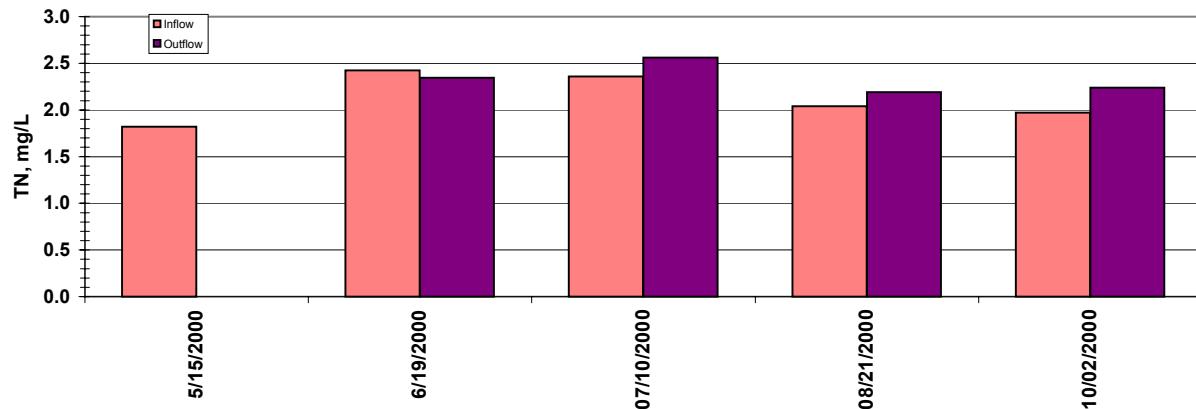
#### Exhibit E-23

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No. 15, April 2000 - October 2000.

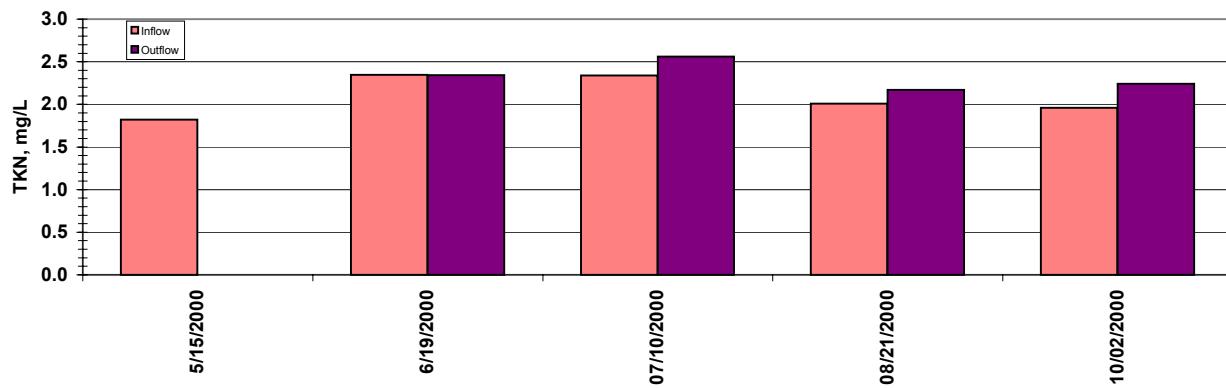
#### Key Conditions:

Substrate: Shellrock  
Depth: 30 cm  
HLR: Recirc  
Other:

#### TOTAL NITROGEN



#### TOTAL KJELDAHL NITROGEN



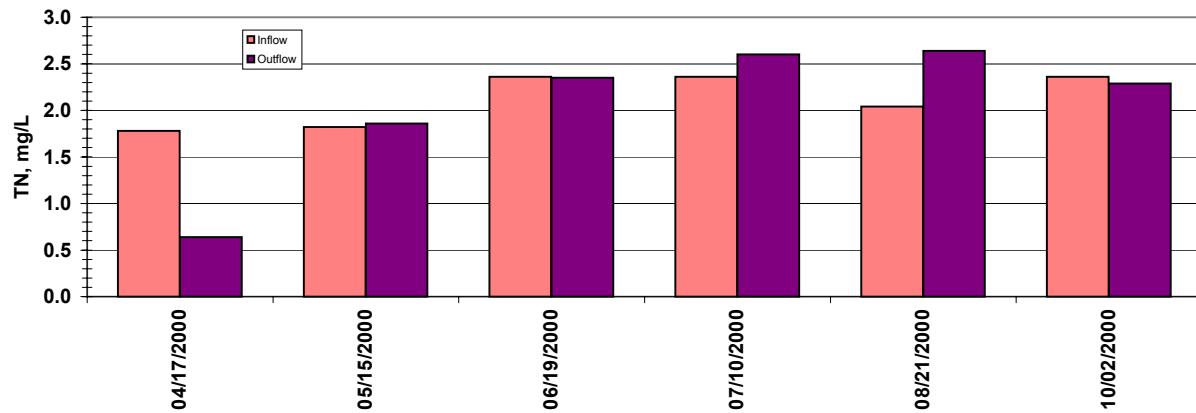
Note: Treatment in dry down from 3/16/2000- 5/15/2000; no water samples taken during this time.

#### Exhibit E-24

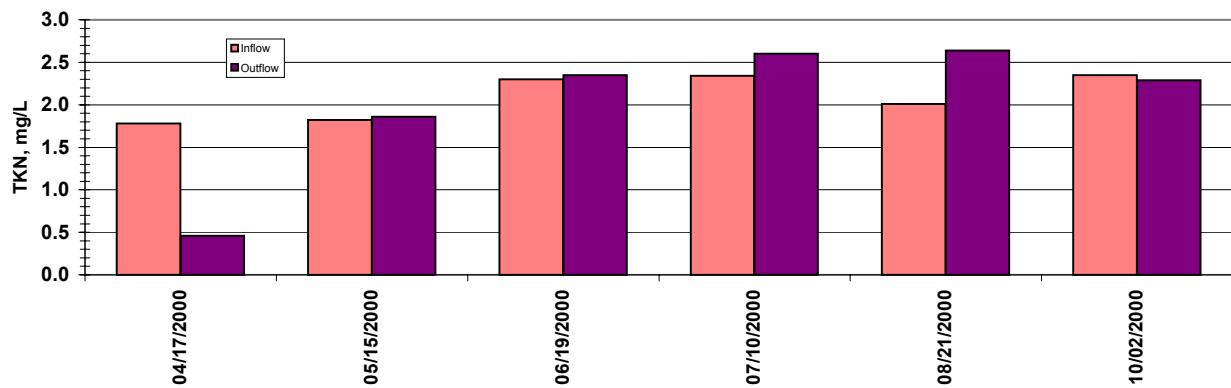
Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No. 16, May 2000 - October 2000.

**Key Conditions:**  
Substrate: Shellrock  
Depth: 0 - 30 cm  
HLR: Seasonal  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



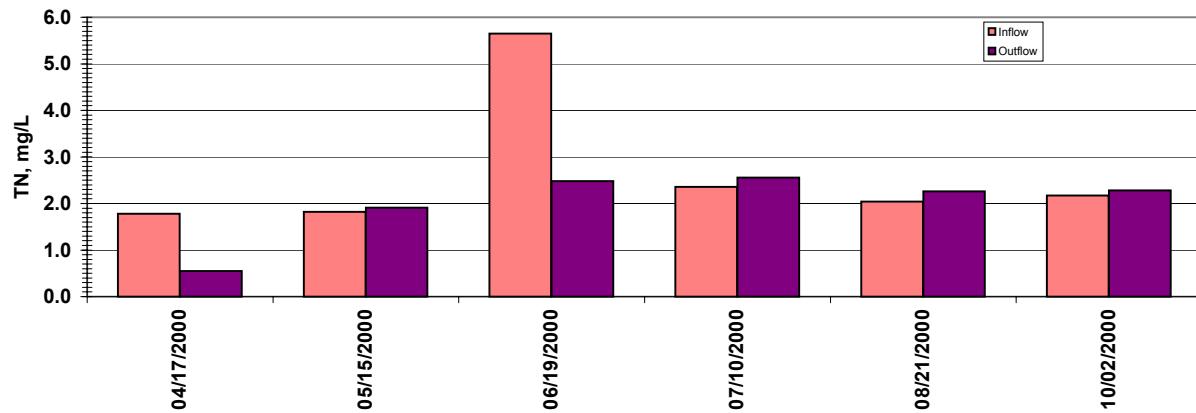
#### Exhibit E-25

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No. 17, April 2000 -October 2000.

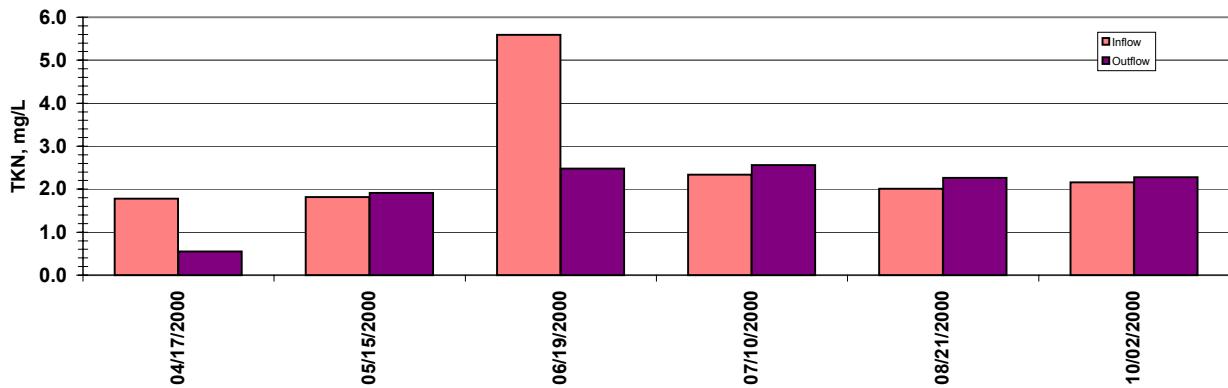
#### Key Conditions:

Substrate: Sand - HCl  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



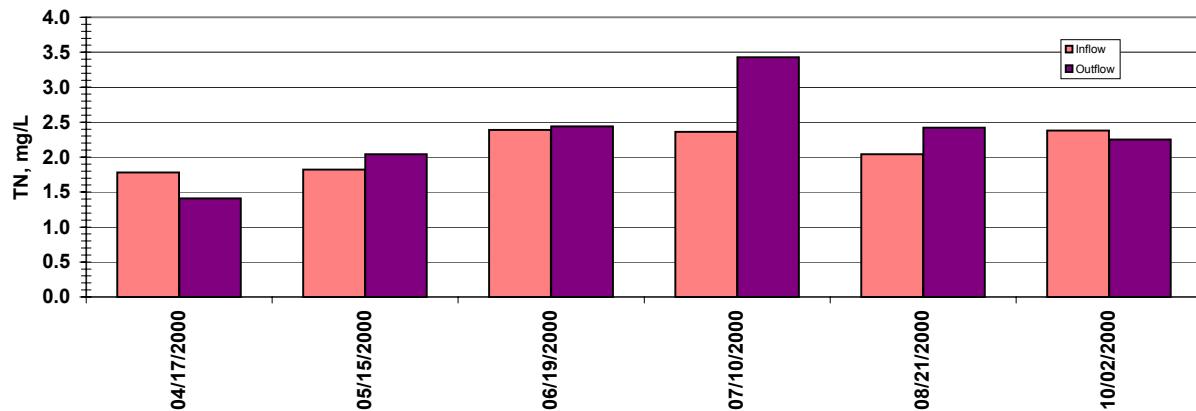
#### Exhibit E-26

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No. 18, April 2000 - October 2000.

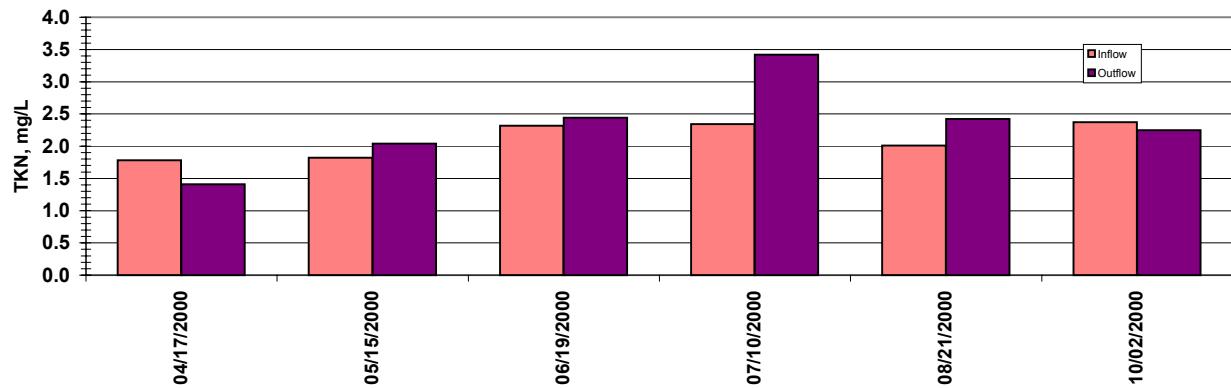
#### Key Conditions:

Substrate: None  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



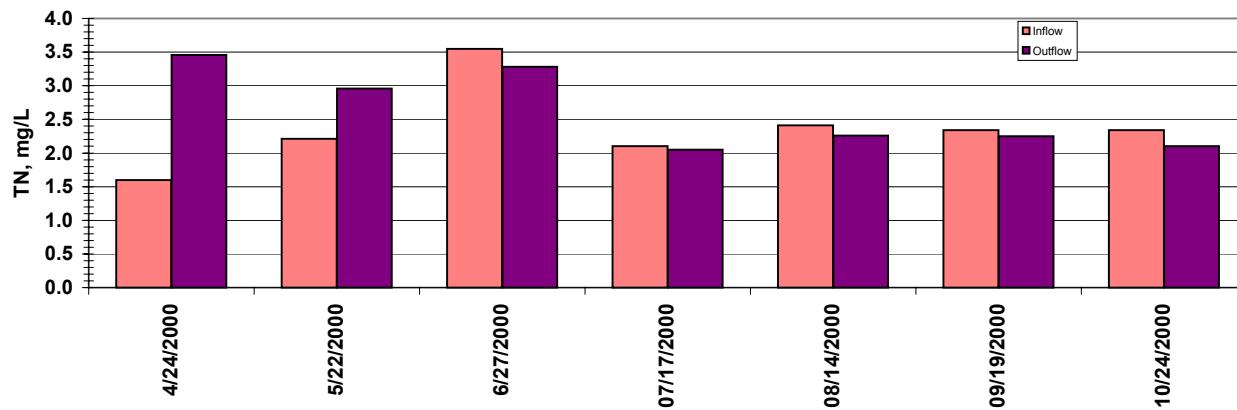
#### Exhibit E-27

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for Porta-PSTA Treatment No. 19, April 2000 - October 2000.

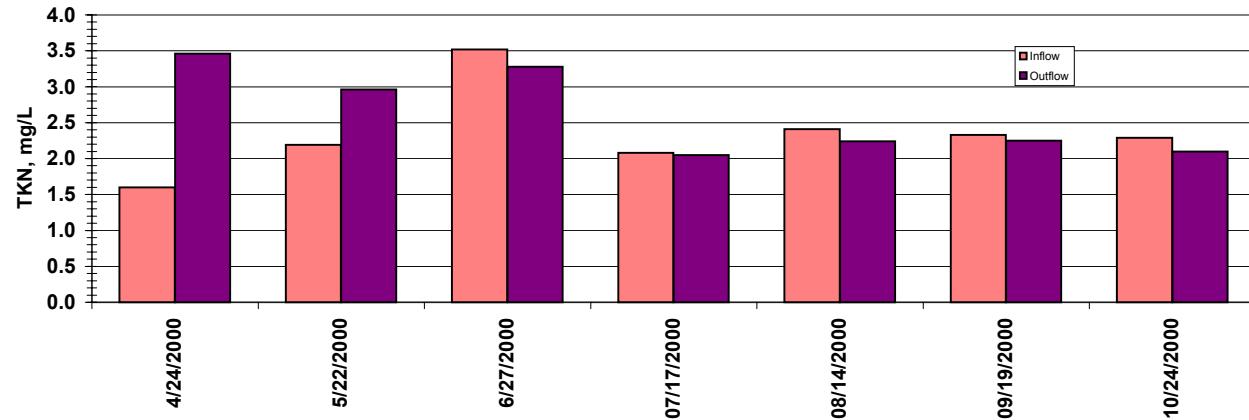
#### Key Conditions:

Substrate: Synthetic  
Depth: 30 cm  
HLR: 6 cm/day  
Other:

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN

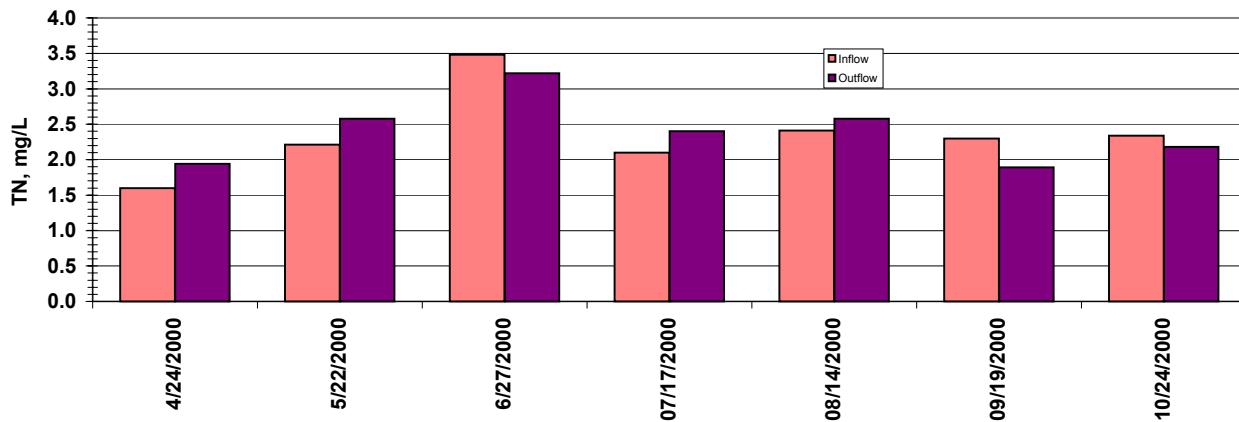


#### Exhibit E-28

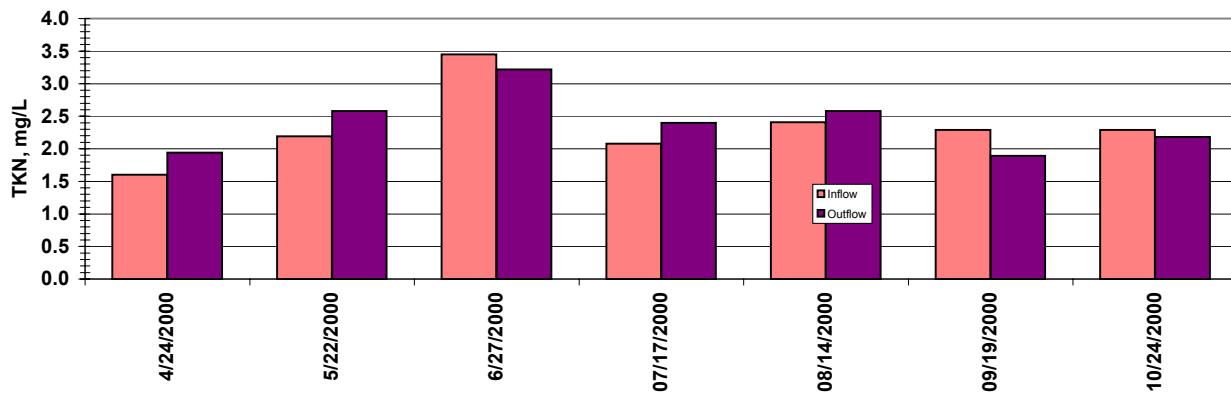
Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for South Test Cell Treatment No. 4, April 2000 - October 2000.

Key Conditions:			
Substrate:	Peat - Ca		
Depth:	30 cm		
HLR:	6 cm/day		

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN

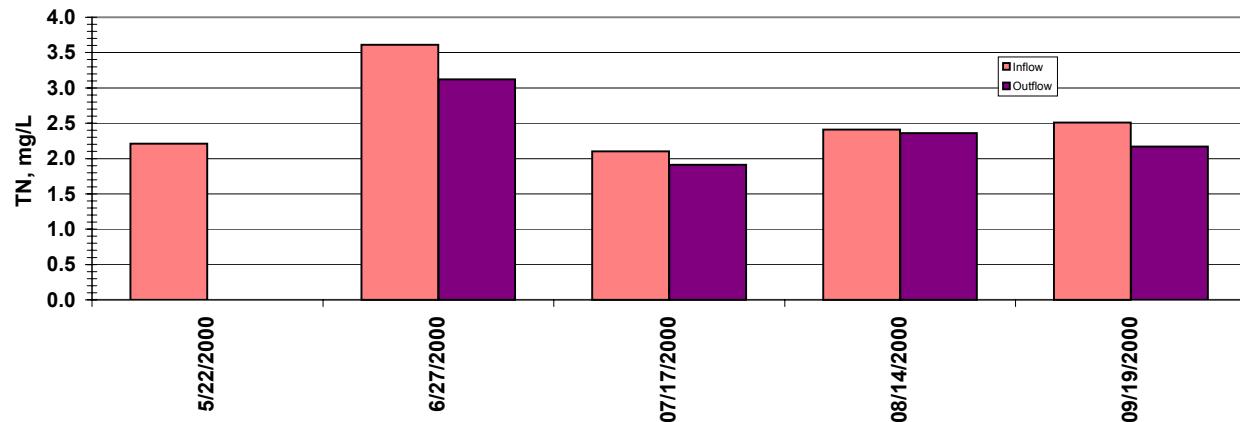


#### Exhibit E-29

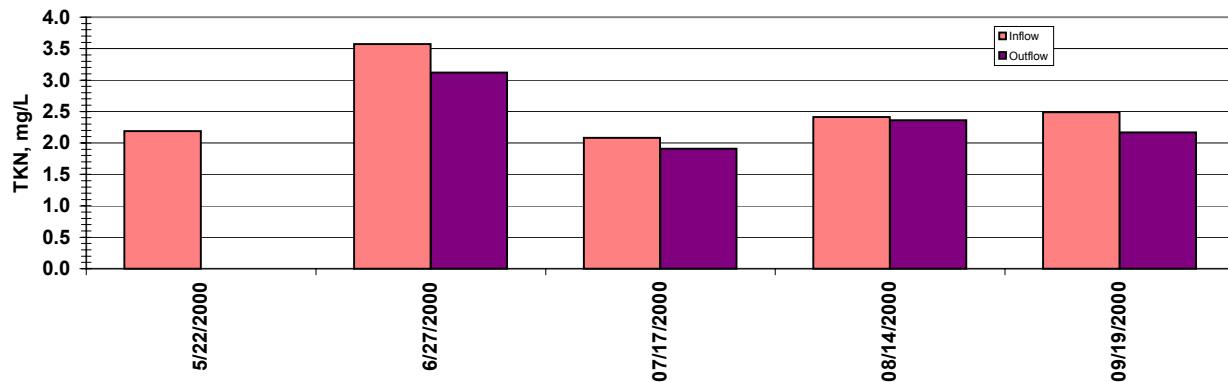
Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for South Test Cell Treatment No. 5, April 2000 - October 2000.

Key Conditions:			
Substrate:	Shellrock		
Depth:	30 cm		
HLR:	6 cm/day		

### TOTAL NITROGEN



### TOTAL KJELDAHL NITROGEN



Notes: Treatment in dry down mode; no outflow samples taken from 3/9/00- 5/30/00.

No inflow to treatment from October 2000 to December 2000 because of mechanical difficulties.

#### Exhibit E-30

Inflow and Outflow Weekly Average Values for Total Nitrogen and Total Kjeldahl Nitrogen for South Test Cell Treatment No. 6, April 2000 - October 2000.

Key Conditions:		
Substrate:	Shellrock	
Depth:	Seasonal	
HLR:	6 cm/day	